RURAL AMERICA AT THE CROSSROADS: NETWORKING FOR THE FUTURE

CONGRESS OF THE UNITED STATES
OFFICE OF TECHNOLOGY ASSESSMENT

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Foreword

Rural America is at the proverbial crossroads. Many rural communities show signs that raise concern for their future: loss of economic vitality, a relative decline in income, high unemployment, low workforce participation, and an exodus of talent. Advances in communication and information technologies, however, hold promise for rural America, by reducing the barriers of distance and space that have disadvantaged rural areas. Rural businesses can now link to other businesses or access major markets, even in other countries, just as readily as those in urban areas, while still enjoying the many distinctive benefits of rural living.

This study explores the role that communication technologies can play in securing rural America's future. It develops several policy strategies and options to encourage such development. The study was requested by the Joint Economic Committee of Congress and Senators Charles E. Grassley and Orrin G. Hatch.

OTA gratefully acknowledges the contribution of the advisory panel, workshop participants, contractors, reviewers, and many others who provided information, advice, and assistance. However, OTA bears sole responsibility for the contents of this report.

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NOTE: OTA appreciates and is grateful for the valuable assistance and thoughtful critiques provided by the advisory panel members. The panel does not, however, necessarily approve, disapprove, or endorse this report. OTA assumes full responsibility for the report and the accuracy of its contents.

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Chapter 1

Summary and Policy Conclusions

Introduction

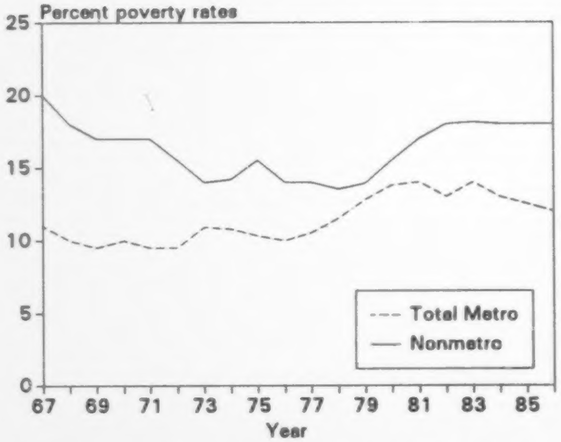
Rural communities have played a central role in American life. Politically, they have served as the centerpiece of American democratic thought. Economically, they have provided the labor, food, and other natural resources that fueled and sustained the industrial revolution. Now comprising 24 percent of the Nation's population and 28 percent of its labor force, rural areas continue to be a source of inspiration and sustenance. In the minds of many, these communities reflect and reinforce the traditional American values of community and individualism. Increasingly, they are viewed as a haven from the intractable problems caused by urban development.

Notwithstanding their basic strengths, many rural areas today show signs and symptoms that raise concern for their futures. These include a loss of economic vitality, a relative decline in income, high unemployment, low workforce participation, and a high level of migration out of rural areas. Thus we find that per-capita income in rural areas is much lower than in urban areas, and that the communities considered to be the most rural are the worst off. Rural poverty rates, having been on an upswing since the early 1970s, are also higher than urban poverty rates (see figures 1-1 and 1-2).

Rural areas are showing a loss of economic vitality, a relative decline in income, high unemployment, low workforce participation, and a high level of outmigration.

A number of forces underlie the problems that now beset rural communities. These forces are structural in nature, so they are unlikely to be easily reversed. One of the most important forces is the dramatic shift in the economy away from the production of primary resources and manufactured goods towards the provision of services. Since rural areas are more dependent on these declining sectors,

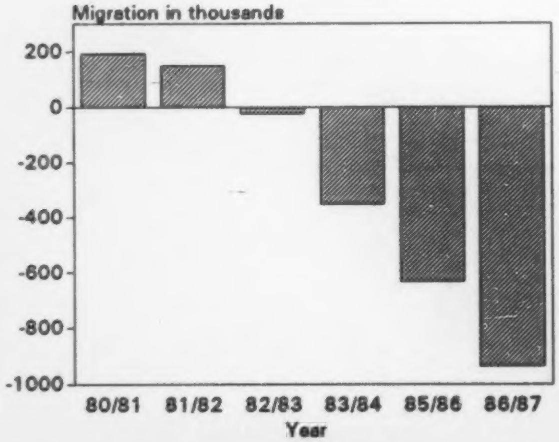
Figure 1-1—Poverty Rates by Residence*



*Metro and nonmetro for 1985 based on the Census of 1980, for 1969 and 1971-83 on the 1970 Census, and for earlier years on the 1960 Census. No 1984 data.

SOURCE: Bureau of the Census, Current Population Survey, as cited in U.S. Department of Agriculture, *Rural Economic Development in the 1980's: Prospects for the Future* (Washington, DC: U.S. Department of Agriculture, 1988), p. 12.

Figure 1-2—Nonmetropolitan Net Migration*



* For 1980-83, nonmetropolitan counties are as defined in 1970; 1984 definition is used thereafter (noninstitutionalized population).

SOURCE: U.S. Bureau of the Census, as cited in U.S. Department of Agriculture, *Rural Economic Development in the 1980's: Prospects for the Future* (Washington, DC: U.S. Department of Agriculture, 1988), p. ix; U.S. Department of Commerce, *Geographic Mobility: March 1986 to March 1987* (Washington, DC: U.S. Bureau of the Census, 1989), series P-20, No. 430.

Advances in communication and information technologies coincide with a shift toward a more service-oriented economy.

they are especially vulnerable to this shift (see figure 1-3). With the emergence of a global economy, and the rise of the newly industrialized countries, rural areas are facing intense competition in resources and primary manufacturing from abroad.

Not all trends are necessarily negative. Tremendous advances in communication and information technologies, and radical changes in the way these technologies can provide services have occurred along with the shift toward a more service-oriented economy. Many people believe that these developments hold promise for rural America, because communication technologies reduce the importance of distance and space—two factors that disadvantage rural areas. Rural communities with modern communication technologies can more easily deal with their problems. Using advanced communication technologies, for example, a rural business can link to other businesses, or access major markets, just as easily as a business in an urban area.

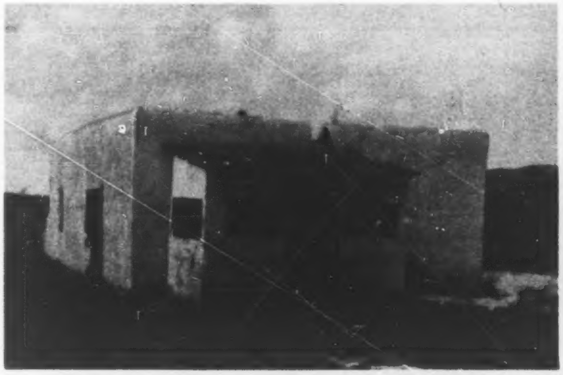
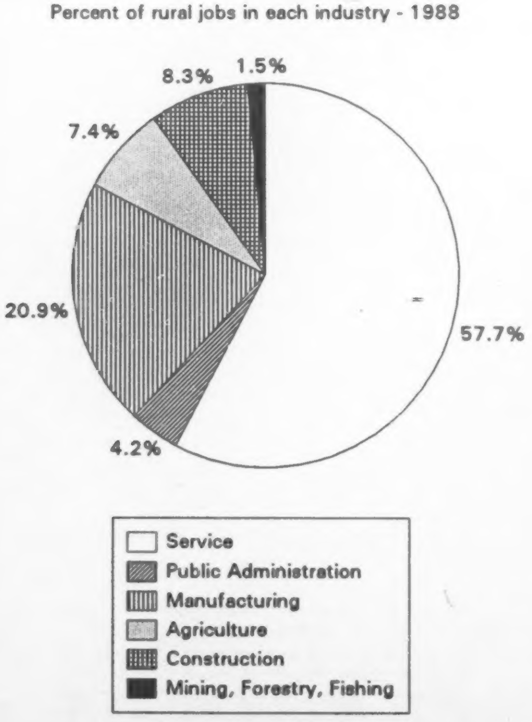


Photo credit: Mark G. Young

An uninhabited shack in a ranching community in rural Colorado.

Figure 1-3—Employment of Rural Residents, 1988



SOURCE: U.S. Department of Commerce, *Rural and Rural Farm Population: 1988* (Washington, DC: U.S. Bureau of the Census, 1989).

Other observers are less sanguine about the impact of technological developments on rural America, because communication networks work in two directions—they could undermine rural economies rather than bolster them. Skeptics warn against being too fixated on technology, because technology, by itself, cannot bring about development.

Economic development requires the coming together of a wide array of people, skills, and resources. How, and the extent to which, new communication technologies can be used to improve the prospects for success depend on a number of factors. This study defines the role of communication in the development process and develops several criteria for policy strategies and options that encourage such development. Policy options that meet these criteria are outlined and discussed.

Request for the Study

This study was requested by the Joint Economic Committee of Congress and by Senators Charles E. Grassley and Orrin G. Hatch. Noting that the widespread deployment of communication and information technologies will inevitably bring major changes in the way all Americans live and work, the

Economic development requires the coming together of a wide array of people, skills, and resources.

committee asked OTA to examine how these developments might affect economic conditions in rural America. The questions that the committee asked OTA to address are:

- Will technological advances be available in a timely manner to rural America?
- Does information-age technology involve economies of scale and scope that will enable rural businesses and communities to adopt these technologies?
- What are the expected economic effects of information-age technologies in rural areas, particularly on employment (including job creation, training needs, and job displacement) and investment (including capital requirements and public infrastructure)?
- Which rural areas are likely to have the greatest ability to make use of these new technologies?
- What roles can the various levels of government play in fostering information-age technology?
- Can rural America expect to be competitive in serving national and international markets for the goods and services of this new era?

What Are the Stakes?

The Stakes for Rural America

Although often isolated and remote, America's rural communities do not exist in a vacuum. They will inevitably change as the world around them changes. As communication technologies extend rural ties and expand rural markets, these communities will become increasingly vulnerable to national and global trends and events. For rural America, the most critical of these developments will be the adjustment to a highly competitive, service-based, global economy and the emergence of major, worldwide environmental concerns that will compel them to reorient their economies. Since many rural communities lack essential financial and human resources, and often depend on a single industry for the lion's share of their wealth and vitality, their ability to adapt to these changes is limited. Without some form of intervention, these communities are headed for decline.

Photo credit: Mark G. Young

A study in contrast: a new house with a satellite dish abuts an abandoned adobe hut in Garcia, Colorado.

If these technologies are to enhance the economic prospects of rural areas, then policymakers must develop policies to create the most favorable conditions for their use to go along with policies that promote technology deployment.

Advanced communication and information technologies are certainly not "the" solution to the many problems confronting rural America. In fact, one needs only to look historically to see examples where the deployment of these technologies has left rural communities worse off. However, in the current economic environment, in which businesses are using these technologies strategically to gain a competitive advantage, communities and businesses that have limited access to them are unlikely to survive. While not a panacea, in a global, information-based economy, these technologies could help rural communities overcome a number of the barriers that have limited their economic well-being in the past.

Precisely because communication technology is a mixed blessing and often functions as a double-edged sword, it is essential that decisionmakers clearly understand, and take into account, not only the benefits and costs associated with this technology, but also—and perhaps more importantly—the socioeconomic conditions under which the benefits

Box 1-A—Telecommunications for Business

Each of Edward D. Jones & Co.'s offices is a far cry from Wall Street—from the hustle and bustle, maybe, but not from the stocks and bonds. Jones & Co. is a full-service brokerage house specializing in low-risk securities serving mainly rural communities and towns with fewer than 20,000 people. The company uses advanced telecommunications to deliver big-city financial services to smaller towns and rural communities.

When Jones & Co. initially branched out from its main office in Maryland Heights, MO in 1955, it relied on teletype machines to connect its separate one-person offices to the headquarters. By 1980, when the company had completely switched over to computers, it had grown to some 300 retail branches. In the 10 years since, Jones & Co. has mushroomed to nearly 1,600 offices in 44 States, and has upgraded the computer hardware and software as growing demand has outpaced the capacity of the successive systems. With more retail offices than any other financial services company in the United States, Edward D. Jones & Co. earned $249 million in revenues in 1989.

More recently, Jones & Co. invested $30 million in 1988 to install a private two-way satellite network to link its dispersed and numerous offices that went online in 1990. With rising costs of local and long-distance communications services, which can be a particular problem in rural areas, the very small aperture terminal (VSAT) satellite system gives the company greater control of its telecommunications and stabilizes these costs. Jones & Co.'s computer network has links to banks to expedite crediting clients' accounts, insurance companies, mutual fund firms, and information services such as Standard & Poor's MarketScope service. With VSAT's video capacity, Jones & Co. is able to broadcast live product presentations or training sessions between sites. The VSAT technology also permits the company, which plans to expand to 3,000 offices by 1991, flexibility in adding or moving branch locations.

SOURCES: Robert Cullen, "Trial by Fire," Edward D. Jones & Co. press package; Edward D. Jones & Co., "Satellite Technology Brings Wall Street to Main Street," press release, undated; Edward D. Jones & Co., "Edward D. Jones & Co. Sees Technology As Key to Rapid Growth," press release, undated; as cited in MESA Consulting, "Telecommunications and Rural Economic Development," prepared for United States Telephone Association, October 1990.

are most likely to be realized. If these technologies are to enhance the economic prospects of rural areas, then policymakers must develop policies to create the most favorable conditions for their use to go along with policies that promote technology deployment.

Market as well as government decisions determine how communication technologies will be deployed in the future. Rural America clearly has tremendous stakes in the outcomes of these decisions. Certain courses of action can provide rural communities an opportunity to gain greater control over, and perhaps reverse, the direction in which they are headed. Other actions are likely to foreclose this possibility.

The National Stakes

Whether rural communities experience development or decline is not merely a local concern. All Americans have a stake in how well rural communities cope with, and take advantage of, the rapidly changing environment in which they find themselves. The kinds of economic activity that occur in rural America can have a significant impact on the Nation's overall prosperity.

Long-term economic development requires the continual flowering of new centers of innovation. As we increasingly realize, such innovation takes place primarily in relatively small local enterprises.[1] Most rural areas, however, have been forced to play a supportive role in this process. With their long distance from commercial centers, and their sparse populations, the small communities in these areas have generally been unable to assemble the skills, information, and capital required for development to take place. These barriers of distance and space are likely to be much less formidable in the future. By taking advantage of advanced communication and information technologies, rural communities may find it easier to access and assemble the resources that foster innovation and growth in city regions. Equipped with communication and information technology and the wherewithal to take advantage of

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[1] See for discussions, Jane Jacobs, *Cities and the Wealth of Nations* (New York, NY: The Viking Press, 1985); Michael J. Piore and Charles F. Sabel, *The Second Industrial Divide: Possibilities for Prosperity* (New York, NY: Basic Books, 1984); and David Osborne, *Laboratories of Democracy* (Boston, MA: Harvard Business School Press, 1988).

Economic development in rural areas will not only affect national economic performance, it will also help determine how well the United States fares in an increasingly competitive, global economy.

it, rural communities can be viewed not as potential problems, but rather as untapped national resources (see box 1-A).

Economic development in rural areas will not only affect national economic performance, it will also help determine how well the United States fares in an increasingly competitive, global economy. Since 1970, the U.S. trade position has steadily worsened, while those of our major competitors continue to improve. Much of the increased trade competition is in the area of primary goods and low-technology industries—the industries in which rural areas have traditionally specialized. Rural areas can contribute to an improvement in the U.S. trade balance if economic development in these areas leads to greater economic diversification and/or a shift to those industries—such as services and high-tech manufacturing—that are growing in demand worldwide.

Rural economic development can contribute not only to the national economy, it can enhance the overall quality of national life. If rural communities use new technologies to diversify their economies, becoming less dependent on the production of primary resources, they may make less of a claim on the Nation's environmental resources. Communication technologies can also be used to substitute for travel, thereby conserving energy and reducing air pollution.

The economic viability of rural communities will determine the extent to which these areas can provide an amenable lifestyle and a counterbalance to the pull of urban implosion. Many urban regions suffer from problems of overdevelopment: congestion, pollution, crime, high costs of living, etc. Rural areas might provide a means of escape if there were sufficient amenities, such as good schools, adequate health care, and cultural activities. Many elderly are taking advantage of the benefits of rural living by moving to retirement communities established in these areas.

Key Findings

The Diversity of Rural Areas

Although rural communities share a number of common problems, many of their individual characteristics, and the local resources they can draw on to address their problems, are very different (see appendix).[2] One community's strength may be another's weakness. Communities are often endowed differently with respect to their locations, landscapes, and natural and human resources, as well as access to communication and information technologies. For example, Kentucky's location in the center of the United States makes it attractive to foreign capital; New Mexico's Native American and Hispanic populations lend support to a prospering tourist trade; while the forests of Washington State and Maine supply raw materials for the Nation's timber industry. Because of such differences, rural communities will need to pursue a variety of development approaches.

New Ways of Thinking About Communications in Rural Areas

Ironically, at the moment when communication and information technologies are beginning to play a critical role in business, the regulatory structure that once provided rural areas equal access to these technologies is coming unraveled. Divestiture of the Bell System and the shift towards deregulated services, together with the emergence of large

Divestiture of the Bell System and the shift towards deregulated services, together with the emergence of large private networks, are undermining the traditional system of rate averaging and subsidies for local telephone service.

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[2] To capture this diversity, and to better understand its implications for Federal policy, OTA conducted field studies in four States—Kentucky, New Mexico, Washington, and Maine.

WALK IN BEAUTY
AND LIVE IT

Photo credit: Mark G. Young

El Morro, New Mexico.

private networks, are undermining the traditional system of rate averaging and subsidies for local telephone service. These developments have occurred at a time when rural economies are themselves becoming more fragile, and when—given the trend towards a service-based global economy—their information and communication needs are now more important than they have ever been.

If rural areas are not to experience further decline, measures must be taken to assure that they have access to the needed infrastructure. However, the previous means for providing infrastructure to rural areas is no longer sustainable, because of rapid technological change and a more competitive industry environment. Thus, it is time to devise new ways of designing communication systems and delivering communication services to rural areas.

A Rural Area Network would link up as many users within a community as possible—including among them businesses, educational institutions, health providers, and local government offices.

The divestiture of the Bell System and recent technological advances provide a number of new opportunities to do this. Most important is the unbundling of the communication infrastructure,[3] and the subsequent development of new network architectures and new technologies and technological applications.

With unbundling, users no longer must buy services as a single unit. Now they can purchase services separately, on a piece-by-piece basis, configuring them to meet their own particular needs. Many businesses are taking advantage of this capability to develop their own private communication networks.[4] Increasingly they are connecting their various departments through local area networks (LANs) and their offices through metropolitan area networks (MANs) or wide area networks (WANs) (see box 1-B). As the information and communication needs of these businesses become more specialized, so too are their communications systems. For example, banks and other financial institutions have developed specialized communication services, such as the Society for Worldwide Interbank Financial Telecommunications (SWIFT), and manufacturers have developed their own communications protocols, such as the Manufacturing Automation Protocol (MAP). Even system integrators are beginning to specialize in providing networking services.[5]

Just as businesses are taking advantages of these developments to create their own customized communication networks, so too might rural communi-

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[3] Unbundling first appeared in telecommunications with the FCC's Carterfone decision of 1968, which allowed customers to add equipment to their telephones as long as they did not adversely affect the operation of the telephone system or its usefulness to others. The development of open network architecture (ONA) will lead to the further unbundling of the telephone network. If pursued far enough, open architecture would allow independent providers and others to purchase the most elemental functions. They could also create their own products, reconfiguring and customizing these functions to meet their own needs.

[4] In the past, one telecommunication network existed to provide universal service to all users. This arrangement was quite suitable, as users' needs were very similar and the services that could be offered were relatively limited. Businesses used the telephone for voice communication in much the same way that households did. Today, this is no longer the case. Different kinds of businesses increasingly have different kinds of business needs.

[5] For a discussion, see Eli M. Noam, "The Future of the Public Network: From Star to the Matrix," *Telecommunications*, March 1988, pp. 58-59, 65, and 90.

Box 1-B—LANs, WANs, and MANs

Local Area Networks (LANs): LANs are data communication networks that are relatively limited in their reach. They generally cover the premises of a building or a campus. Like all networking technologies, LANs facilitate communication and sharing of information and computer resources by the members of a group. Within the business community, the number of LANs deployed has recently grown by leaps and bounds. Predictions are that in 1992 the number of LANs deployed will surpass 5 million, and more than one-half of all PCs will be connected by LANs.

Wide Area Networks (WANs): Wide area networks are data communication networks that provide long-haul connectivity among separate networks located in different geographic areas. Many businesses are using WANs to extend and restructure their operations on a national or worldwide basis, while at the same time gaining the economies of scale and scope that can be achieved by large-scale, shared networks.

WANs make use of a variety of transmission media, which can be provided on a leased or dial-up basis. WANs can also be privately owned. Recently, many businesses have chosen satellite networks, taking advantage of the recent development of relatively low-cost small aperture terminals to link their various offices to a headquarters facility. General Motors is planning to build the largest network of this kind. Scheduled for operation in 1992, it will consist of 9,700 very small aperture terminals that will connect GM locations nationwide.

Metropolitan Area Networks (MANs): Still in the field-testing stage, metropolitan area networks provide switched data networking services at very high speeds (45 to 50 megabits per second) within a geographic area of at least 50 miles. MANs connect LANs to LANs, as well as LANs to WANs. As designed by Bellcore, MANs will provide Switched Multimegabit Data Services (SMMDS), which will allow users to set up a virtual (or logical) private network, and give them access to individual services on demand. These networks are designed for shared usage.

SOURCE: Office of Technology Assessment, 1991.

ties. However, whereas many business networks are established along functional lines, Rural Area Networks (RANs) would be configured, instead, around the geographic boundaries and needs of an entire community. Designed on the basis of a ring (or campus-type) architecture, a RAN would link up as many users within a community as possible—including among them businesses, educational institutions, health providers, and local government offices (see figure 1-4). Rural Area Networks could be linked statewide, perhaps by piggybacking on the State government and/or the State educational networks.

Rural Area Networks have a number of potential benefits:

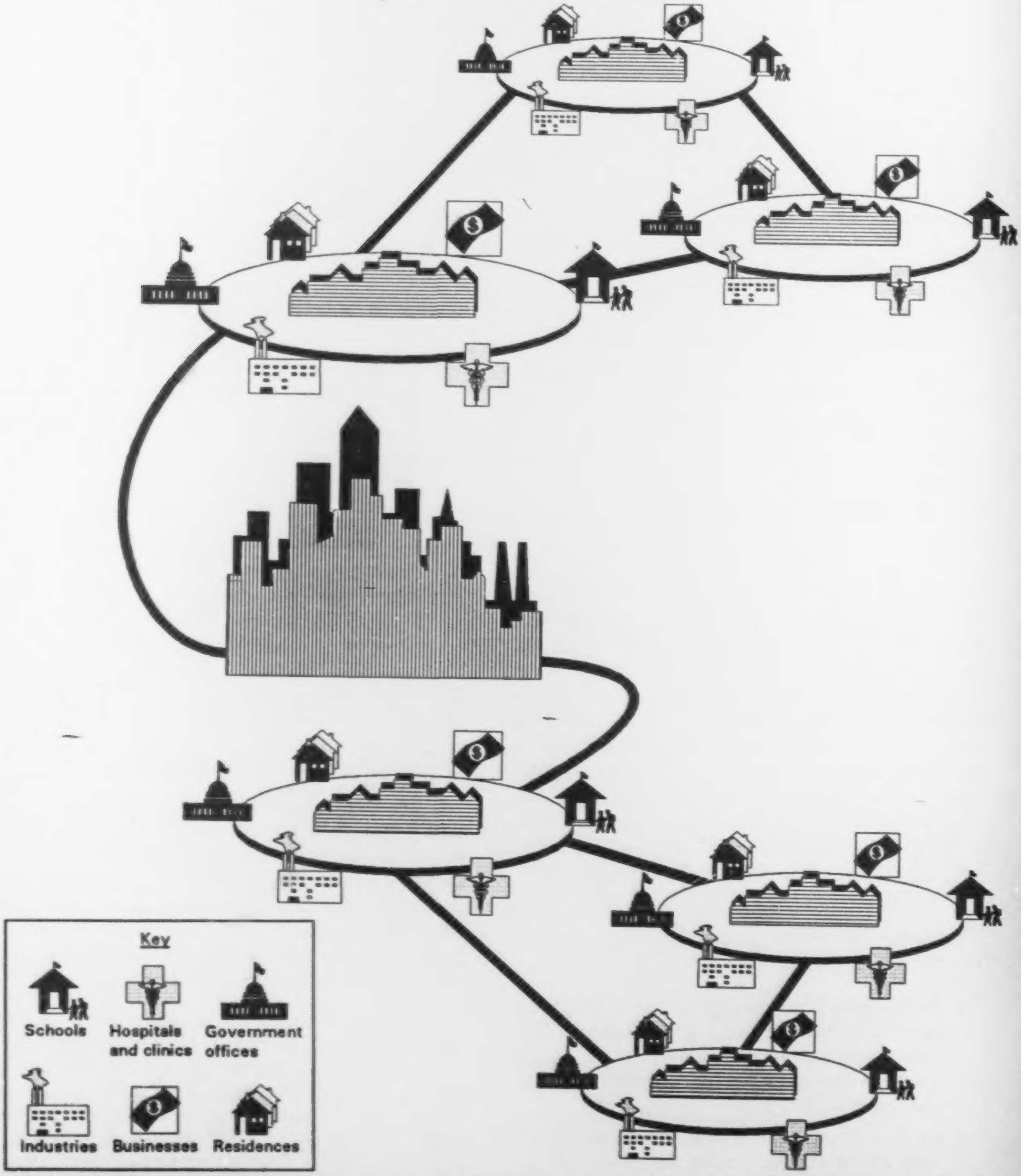
- RANs could foster the deployment of advanced technology to rural areas in an economically viable manner. By pooling diverse users, they would provide considerable economies of scale and scope.
- Built to meet shared needs, they could foster cooperation and community ties.
- RANs would overcome the limitations of technological expertise in rural areas since they could be designed by one systems integrator.
- RANs would induce communication providers to be more responsive to the communication needs of rural communities. By joining forces, rural users will be able to exert greater leverage in the marketplace.

Wider Technological Choice

In creating such networks, rural communities can choose from a variety of technologies, particularly new technologies such as digital radio and advanced satellites as well as niche markets for old technologies, each of which have special applications for remote, rural areas. Many of these technologies are radio-based so their cost depends more on total demand than on population density.

With digital radio, for example, cable is not required beyond the Radio Carrier Station; each subscriber has a radio transceiver that provides a standard phone service drop. Whereas it can cost on average about $10,000 per subscriber to provide access lines via copper wire, the average cost today with digital radio is about $3,000 per subscriber. Digital radio systems capable of carrying four DS-3 (each transmitting at 45 megabits per second) lines are expected to be available in the early 1990s.

Figure 1-4—Rural Area Network


Key
Schools
Hospitals and clinics
Government offices
Industries
Businesses
Residences

A Rural Area Network would be designed to foster the deployment of advanced technology to rural areas in an economically viable manner by pooling the communication needs of a community's many users—especially the businesses, educational institutions, health providers, and local government offices.

SOURCE: Office of Technology Assessment, 1991.

If rural communities are to make use of an assortment of technologies to create Rural Area Networks, they must develop strategies to optimize the advantages of each and make them work together.

Advances in satellite technology also hold considerable promise for rural areas. Because satellite-based signals are broadcast over a wide area, virtually any user within the satellite's "footprint" can easily access the network at the same cost. The mobile satellites being designed now for launch in the early 1990s will have sufficient power to enable the use of a large number of small, mobile terminals on the ground. Portable units will be self-contained and lightweight, capable of fitting on a company or family car. These terminals will allow the user to connect with private networks or the public telephone network for a variety of services, including voice, data, facsimile transmission, and computer-to-computer communications. Most recently, Motorola is developing a global, satellite-based cellular network technology, called Iridium, that, once operational, could greatly reduce the cost of delivering communication services to rural areas.

Technological advances have also reduced the cost of deploying wireline communication services to rural areas. For example, the development of remote digital switching modules now permits carriers to use fewer expensive host switches to provide advanced intelligent services such as access to 800-number databases. The cost savings can be substantial. One host switch, such as the AT&T 5SEE, costs approximately $510 million, whereas a remote switching module will cost between $600,000 and $700,000.

The Need for Greater Technological Expertise

If rural communities are to make use of an assortment of technologies to create Rural Area Networks, they must develop strategies to optimize the advantages of each and make them work together. These are by no means easy tasks. Nor does the average rural businessman or woman have the experience, skills, and resources to do this.

Under the old Bell System, few subscribers were required, or even inclined, to explore their service options. Thus, today, many are unprepared to sort out the many options available to them in an industry environment driven by rapid technological change. Taking the time out from normal business operations to come to terms with information-age technologies is also difficult. Most rural businesses are small; job responsibilities are not specialized enough so that any one person could devote much time to become a communication expert. As one rural businessman said: "I run my business on a shoestring. I supervise operations; keep the books; and even sweep the floor. When would I ever have time to learn about how to use communication strategically?"

Nor are there many people to whom rural businesses can turn for help. In a competitive environment, many communication vendors are focusing their energies on the needs of the much more lucrative large business users. Among those who have supported small rural businesses in the past—such as agricultural extension agents, economic development officials, or the local chambers of commerce—few recognize or understand the economic development opportunities that new technologies offer. It is not surprising that when a rural business, or a rural community, has been successful in deploying new technology effectively, there has generally been a knowledgeable, energetic, and visionary individual involved.

Enhanced Technology Requirements

In taking advantage of the new technological capabilities, businesses are changing the way they conduct business. More and more, they are using technology to gain a competitive strategic advantage. For example, as in the case of electronic data interexchange (EDI), communication technologies are being used to gain competitive advantage over competitors (see box 1-C). Within companies they are being used to improve the efficiency and effectiveness of business operations. In addition, they are being used as a basis for creating new products and services. For this reason, it is imperative that rural communities not be left behind technologically.

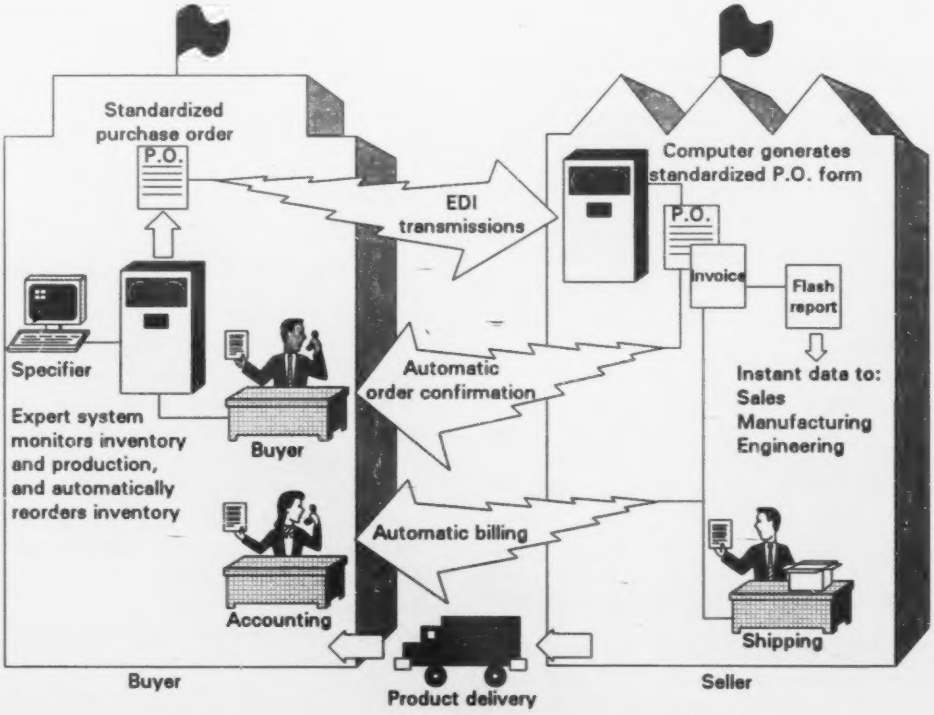
It is not clear, however, just what level of technological deployment is needed for rural areas to keep pace. Many of the services that will likely be required by an individual rural business could be

Box 1-C—Electronic Data Interexchange

Electronic data interexchange (EDI) is a notable example of how information and communication technologies are emerging as important strategic tools for efficient and effective business operations. EDI is essentially the modern, computer-based method by which companies order, invoice, and bill their products and services. Such common transaction functions as invoices, shipping notices, and bills, which traditionally have entailed the transfer and processing of paper documents, are replaced by electronic transfers between the businesses' computers.

Electronic data interexchange improves the efficiency and effectiveness of operations by empowering businesses to purchase supplies and to produce and distribute products precisely when and where they are needed. The company's computer system, for example, will initiate a purchase order and execute the purchasing transaction when an item is requested and removed from the inventory. The price, terms, and conditions of the contract are all stored in the computer. In addition to the considerable savings gained as inventory costs are reduced, EDI also minimizes human clerical error and the considerable processing costs involved with paper transactions. By reducing or eliminating the prolonged and often error-plagued paper trail, large retailers and manufacturers are able to gain a competitive advantage by streamlining transactions with their suppliers and buyers.

SOURCE: Office of Technology Assessment, 1991.


Standardized purchase order
P.O.
EDI transmissions
Computer generates standardized P.O. form
P.O.
Invoice
Flash report
Instant data to:
Sales
Manufacturing
Engineering
Specifier
Expert system monitors inventory and production, and automatically reorders inventory
Buyer
Automatic order confirmation
Automatic billing
Accounting
Shipping
Buyer
Product delivery
Seller

How electronic data interexchange internally and externally expedites business transactions.

SOURCE: Reprinted from *Datamation*, Mar. 15, 1988 © 1990 by Cahners/Ziff Publishing Associates, L.P.

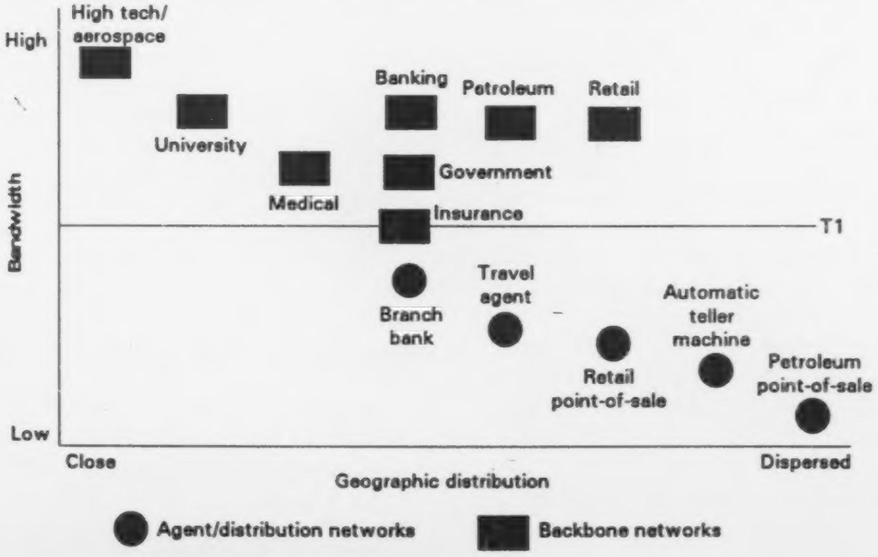
provided with narrowband (64 kilobits per second to 1.5 megabits per second) capacity (see figure 1-5). However, if rural businesses pool their communication needs, they can benefit from the same kind of efficiencies that large businesses enjoy by using broadband technology (1.5 to 45 megabits per second).

In evaluating a rural community's technological requirements, one must not only consider a community's own economic activities, but also—and increasingly—the activities of its competitors.

In an information-based economy, communication needs are relative. In evaluating a rural community's technological requirements, one must not only consider a community's own economic activities, but also—and increasingly—the activities of its competitors, whether they be businesses in urban areas or in other countries. Estimating rural needs in relationship to its competitors is, however, a very complicated and uncertain task. There is currently not a consensus about the capabilities large business users need, and within what time frame. Nonetheless, it is clear that the deployment of advanced technology in rural communities is likely to lag well behind that in urban areas. With few exceptions, communication vendors are focusing their development and marketing efforts on the large, lucrative business customer, instead of bringing advanced technology to remote areas (see ch. 3).

Regulatory policy reinforces this situation. Regulators generally do not focus on promoting economic development, so they do not view rural needs in relative terms. Instead, they tend to consider needs for the present, evaluating them on an individual user, service-by-service basis. Accordingly, they contend that the needs of most rural businesses can be met by deploying narrowband capabilities ranging from 64 kilobits to 1.5 megabits, which later can be upgraded to broadband capabilities of 45 megabits. From the regulators' point of view, infrastructure modernization should focus on immediate problems such as assuring that all subscribers have single-party lines, digital switching facilities, and touch-tone dialing.

Figure 1-5—Bandwidth Requirements in Industry



Bandwidth requirements for different types of users.

SOURCE: Mary Johnston and James Herman, "Two Tracks to the Future of Private Networks," *Business Communications Review*, April 1990, p. 18. Reprinted with permission of publisher, Business Communications.

Photo credit: Mark G. Young

An example of the importance of information technologies in rural areas: fax service in Espanola, New Mexico.

This approach is inappropriate for the development of community-based Rural Area Networks. Networks that seek to pool business needs or that use communication technologies to address social needs as well as business concerns will require broadband capacity. The State of Maine's education network already uses three DS-3 lines, and this capacity will likely not suffice for long. The State of Michigan also plans to deploy a statewide broadband network.

In such situations, an evolutionary approach to network modernization would be unwise. Broadband technology is optimally designed for sharing. It provides new ways of organizing communication networks, and is not a mere extension of narrowband technology. Upgrading can be costly. The amount of capital available for network modernization is particularly limited in rural areas, so care must be taken to assure that investments made now do not preclude the timely installation of more advanced technologies in the future.

Joining Technology Policy to Economic Development Policy

Notwithstanding the many opportunities that new technologies afford, technology, in and of itself, cannot level the playing field for rural areas and their urban and global competitors. The lack of effective communication links is only one of a number of barriers to economic development. Other barriers—which in many cases are more crucial and immediate—include social problems such as low educational attainment, extreme poverty, and poor health conditions, as well as inadequate physical infrastructure and a shortage of capital. If economic development in rural communities is to be self-sustaining, these problems must be addressed as well. What is required is a holistic approach to economic development that incorporates the idea of comprehensive community development. In most cases, communication technologies can foster and support such an approach; they can be used to provide education, deliver health care, and strengthen local government (see box 1-D). However, to make the most of new technologies, technology deployment and economic development policy need to be joined.

Many benefits can be lost when technology deployment takes place in response to market demand rather than as part of a comprehensive economic development program.

Failure to link the deployment of communication technology to a program for comprehensive economic development could actually harm rural communities. By all measures, whether they be poverty rates, income levels, or levels of educational attainment, rural areas begin from a disadvantaged position *vis-à-vis* urban areas. As the history of communication technology shows, under such circumstances, the mere deployment of technology may expose rural economies to urban competition and hence widen the economic gap rather than narrow it (see box 1-E).

It is only by pooling public and private demand that advanced communication systems can be economically deployed to rural areas.

The impact of mass media on rural businesses provides a good example. The explosive growth of popular magazines intensified competition for ad-

Box 1-D—Technology and Health

The health care crisis in America is an especially acute problem for rural communities. The closing of hospitals and medical facilities and the rising costs of medical insurance pose a serious threat to rural communities and their economies. In Texas, for example, 73 hospitals have been forced to close since 1984; the majority of these served rural communities. To overcome this potentially disastrous trend, Texas Tech University is designing and implementing several telecommunications-based programs to help deliver medical services to rural hospitals, clinics, and practitioners. The University's 4 campuses serve 108 counties and 135,000 square miles in western Texas with a population of 2.5 million people.

The University's Health Services Center launched the Kellogg-Affiliated Remote Environments Network (KARENET) in 1985 to afford doctors in rural west Texas access to vital support mechanisms. KARENET is an online computer network that rural physicians and medical professionals can access by telephone and modem for such programs as recording and monitoring patient care information, consulting with up-to-date treatment procedures and protocols, health-care research, and continuing medical instruction. With $2.4 million funding from the W.K. Kellogg Foundation and with computer support from AT&T, KARENET creates a "medical telecommunity" that benefits the rural hospitals by retaining more patients and benefits the patients by reducing the costs and problems associated with travel.

The Health Services Center also operates MEDNET, a 3-year project "to demonstrate the use of interactive telecommunications systems to link rural hospitals, clinics, and practitioners, with the purpose of improving rural health care by using technology to overcome professional isolation." Funded by a $1.9 million grant from the U.S. Department of Health and Human Services, MEDNET involves several technologies that provide an array of important medical services:

- Two-way interactive video—along with voice, graphics and data—carried over digital T1 telephone lines enables "[t]he primary care physician in the rural hospital [to] communicate with physicians in larger hospitals or medical centers for consultation and diagnosis."
- Personal computers donated by AT&T and special modems (codecs) are used to transfer x-ray images and pathology slides as well as for other office functions such as word processing, spreadsheets, billing, appointments, and record keeping.
- A satellite-delivered continuing education curriculum gives physicians, nurses, and health-care professionals programs that are specially tailored to address rural health concerns. The satellite broadcasts the video program to the 22 participating rural hospitals while a telephone connection completes the two-way audio portion.
- A telefacsimile network that supports 19 hospitals has been particularly useful in requesting and receiving materials from the Health Service Center Libraries and for consulting.

Twelve sites were originally chosen to receive the satellite downlink and display equipment to take part in the continuing education program under the initial grant funding. Others have joined subsequently, and the satellite education project can, according to Jeffrey Cowan, become self-sufficient. For other of MEDNET's program, the expense of the equipment is often a considerable burden for rural facilities, so that seed money and outside funding will be an important determinate to success.

SOURCES: John M. Holden, "Across the Phone Lines," *American Medical News*, Jan. 27, 1989, p. 13. Executive summary, the Texas Tech MEDNET demonstration Project, Texas Tech University Health Services Center, School of Medicine, Lubbock, TX. KARENET Pamphlet. Personal correspondence, Jeffrey Cowan, Satellite Communication Specialist for the MEDNET project, Jan. 10, 1991.

vertising among segments of the publishing industry, and the winners in this competition matched the shifts in the Nation's marketing system. The small, local retailers, who had once served their communities with little competition, suddenly faced a succession of new challengers—department stores, mail-order firms, and chain stores. The metropolitan press increasingly tied its fortunes to department stores and chains; and magazines were well-positioned to run advertisements for nationally marketed consumer goods that were sold through all kinds of outlets.

Many benefits can be lost when technology deployment takes place in response to market demand rather than as part of a comprehensive economic development program. It is only by pooling public and private demand that advanced communication systems can be economically de-

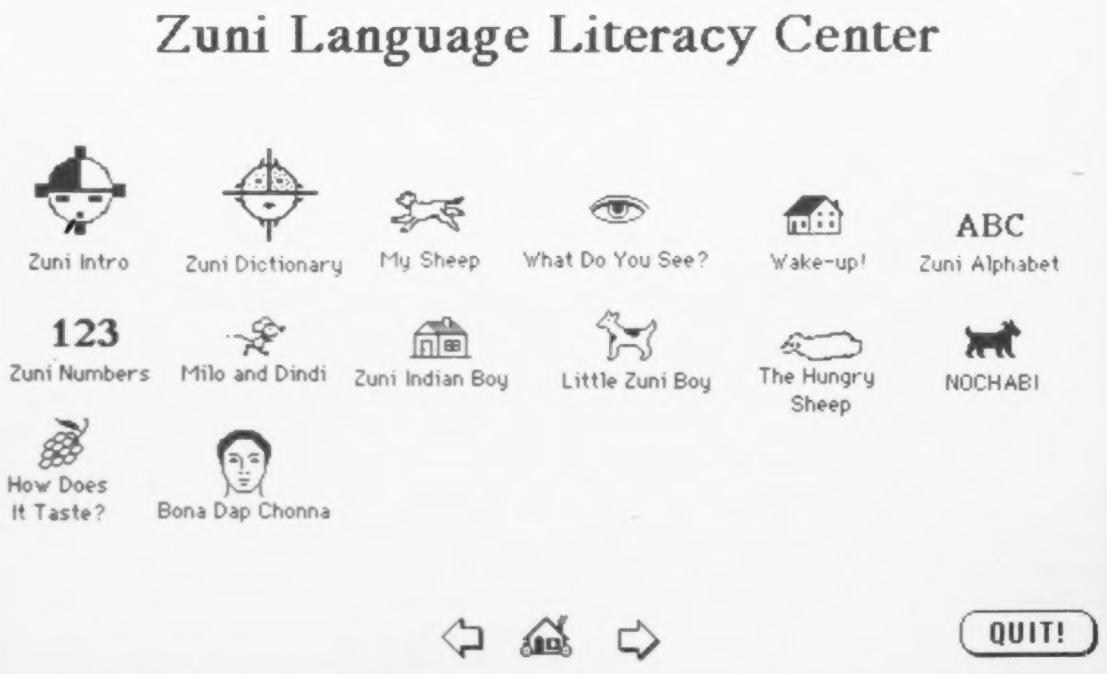
Box 1-E—Technology and Culture

The Zuni Indian Reservation, some 150 miles due west of Albuquerque, lies in New Mexico's dramatically stark and strikingly wild country on the border of Arizona. It is a short way down the road from Gallup, the principal trading center for the huge Navajo Indian Reservation. As on other reservations, unemployment and attendant social problems are severe. The primary source of commerce in Zuni is trade in traditional hand-crafted jewelry.

There is very little about the Zuni Middle School that sets it off from other rural schools. It is housed in a modest and modern one-story, red-brick building. The school children at the middle school wear name-brand sneakers and T-shirts emblazoned with the names of popular music stars—evidence, we are told, of the profound effect of Home Box Office (HBO, the subscription movie broadcaster) and Music Television (MTV, the popular music video channel). However, while the students are exposed to mainstream popular American culture through TV and satellites, the middle school's Language Literacy Center is creating a computer program to help teach the native language to the students, many of whom are only familiar with the language in spoken form and are unable to read or write it. The project is an example of the application of technology to preserve and reinforce culture.

Education is something of a mixed blessing: because the Reservation does not have the resources to satisfy those students who become interested in further education, they are thus inclined to leave and often relocate where the opportunities are commensurate with their ambition and ability. Yet the middle school's Language Literacy Center, with the support of Apple Computers, is entering the Zuni language on HyperCard, a user-friendly application that enables the student to quickly and easily switch between menus and topics as a way of cross-referencing material. The user learns to associate the pronunciations of words and sounds with the spelling. Several lessons, for example, are taught through short stories, and the student can look up an unfamiliar word by switching to the program's dictionary or alphabet.

SOURCE: Office of Technology Assessment site visit, 1990.



A sample menu from the Literacy Center's computer program.

SOURCE: Language Literacy Center, Zuni Middle School.

Federal telecommunications policy is often at odds with States' economic development goals.

ployed to rural areas. Moreover, there are a number of positive synergisms to be gained from linking technology deployment to development policy. Communication vendors will learn more about economic development, while community leaders will gain a greater understanding of the technology. With such cross-fertilization, new development approaches and innovative technological applications could emerge. In addition, with the benefits of sharing communication resources, key individuals and groups that have previously operated independently will find opportunities to cooperate on behalf of their community's development.

The Role of Telecommunications Policy

Successful rural economic development strategies require that communication regulatory policy have parallel—if not consistent—goals and approaches. For example, if economic development goals include the provision of education and health services, then regulatory cost/benefit analysis must include the social benefits of these services in their calculations. This currently is not the case. In most States, those responsible for development and those responsible for regulatory policies have little contact.

Federal telecommunications policy is often at odds with States' economic development goals. Tension between regulatory and economic development goals was less apparent in the past because communications was not considered a key component of economic development. This tension will become more serious as the intensity of interstate and global economic competition increases and as communication is used even more for competitive advantage. It is therefore necessary to reevaluate communication regulatory policies in light of broader economic development goals, and to establish mechanisms for collaboration among players and policymakers in both of these governmental functions.

Orchestrating Change: The Role of the Federal Government

To capitalize on the potential of communication and information technologies for rural America, coordinated action is needed by many different persons, organizations, and institutions. The more broadly economic development is defined, the more varied and numerous are the participants needed for successful rural economic development. Revitalizing rural communities through communication technologies requires the cooperation and commitment of:

1. rural institutions such as schools, libraries, and medical and health providers, and the local and regional development agencies;
2. the communication providers such as the Bell operating companies, independent telephone companies, cable television and satellite companies; and
3. catalysts for change, coming, for example, from colleges or universities serving rural areas, local educational or community leaders, Federal, State, or local government, and private entrepreneurs.

If the cooperation needed for economic development is to take place, government must provide incentives for cooperation, while making it costly for players who fail to work together.

OTA field studies[6] suggest that competition for turf and economic rewards hinders the cooperation needed for economic development and limits the efficient use of communication technologies in rural areas. Many stakeholders have never dealt with one another before, and economic and political incentives are such that they are not inclined to do so now.

With the growing role of communication and information in society and their enhanced market value, the stakes involved in providing these services are higher than ever before. Since only one network may be economically feasible for a particular rural area, stakeholders will be tempted to take

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[6] See appendix.

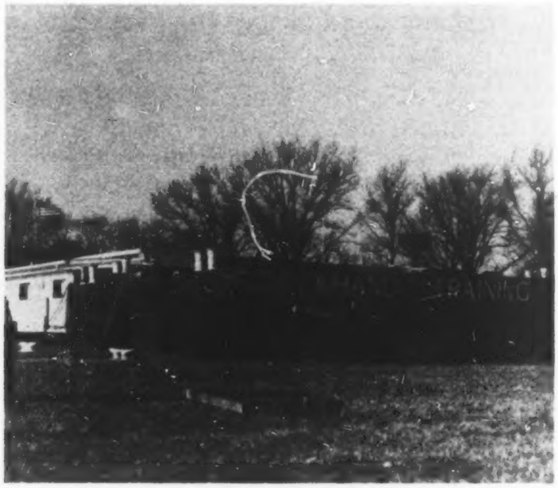

Photo credit: Mark G. Young

The Purchase Training Center outside Paducah, Kentucky, for training barge operators for the Mississippi River.

the lead in configuring and controlling the communication infrastructure for their own benefit. If the cooperation needed for economic development is to take place, government must provide incentives for cooperation, while making it costly for players who fail to work together.

Criteria for Making Policy Choices

OTA has identified a number of criteria that an economic development strategy must meet to increase its chance of success. Experience shows that whether communication technologies will be successful in promoting rural economic development depends not just on their availability to rural communities, but also on the social and economic context in which they are deployed and used. The criteria discussed below are the set of conditions that—taken together—increase the chance for success. These criteria are an interdependent, total package. To the extent that policy measures fail to address all of these criteria, the chance for success and the likelihood that technology will be deployed to the benefit of rural areas will be diminished.

A Vision, Together With Entrepreneurial Leadership

The notion of employing communication technologies to foster rural development is unconventional and relatively untried. To make it work requires vision, imagination, ingenuity, and enlightened leadership.

A Multidimensional, Integrated Notion of Economic Development

Experience suggests that if sustainable economic development is to occur, economic development policies and programs must be conceived in a holistic fashion. Broad-based policies are especially useful when integrating communication technologies into the development process, because these kinds of policies offer new ways for rural communities to achieve economies of scale and scope, and hence economically justify the deployment of technology.

Minimum Cost and the Effective Use of Existing Resources

With current national budget concerns, it is unlikely that there will be substantial additional resources available for promoting rural economic development, unless the value of technology deployment can be convincingly demonstrated. Development strategies, therefore, must make efficient and effective use of existing funds and institutional resources.

Flexibility To Deal With the Variety of Situations and Settings To Be Found in Rural America

Rural communities are extremely diverse; hence development policies must address the individual needs and appeal to the unique strengths of each community. Any State or Federal programs must be flexible enough to allow this.

Flexible and Creative Thinking With Respect to Rural Network Architectures

It generally takes longer to deploy technology in rural than in urban areas, so technological advances that affect rural and urban settings alike could make rural areas worse off. To improve their competitive positions, rural areas need technologies or technical capabilities that can reduce the urban advantage. Increasingly they must think about their communication systems less in terms of past urban models and more in terms of the conditions found in rural communities today.

Policies That Incorporate a Technology Transfer and Educational Component

Many rural communities are unaware of the potential of communication technologies to meet their needs and aspirations. Moreover, they are often stymied in using technology by the higher transaction costs—such as the costs of putting systems together—caused by divestiture and the unbundling of the national communication infrastructure. National development policies, therefore, must provide technical assistance and education to users to familiarize them with communication technology and assist them in planning and devising communication-based development strategies.

Reconciliation of Telecommunication Regulatory Policies and Economic Development Goals

There are a number of instances where economic development goals and telecommunication policy goals are in conflict. Ways must be found to reconcile these differences if communication technologies are to play a major role in future development programs.

Cooperation Among All Key Players

Political turf battles and intense economic competition have doomed many economic development programs in the past. If such programs are to be successful in the future, they must include all of the players and seek solutions. Incentives for such cooperation must be built into economic development strategies.

Economic Viability

The previous means of supporting rural communication systems are becoming increasingly less suitable. New ways of achieving economies of scale and scope in rural areas are needed for the future.

Allowance for Choice

Not all communities are interested in economic development. Development programs must allow communities the choice to adopt them or to opt out in accordance to their wishes.

Public Policies To Meet Development Criteria

Providing Vision and National Leadership

If Federal policymakers are to provide the vision and leadership needed to promote the effective use of communication technologies for rural economic development, they must state this objective as a major policy goal. Establishing a formal goal will signal a commitment and provide a benchmark for weighing policy choices and evaluating policy actions. A statement of goals would also provide a basis for assigning and coordinating institutional responsibilities, and for determining the efficiency and effectiveness of each program.

Failure to emphasize the potential that communication and information technologies have to improve the prospects of rural development may result in inadequate funding and a lack of institutional and human support. The Federal budget crisis makes this even more likely today. With the shrinking pie, beneficiaries of current Federal programs will lobby intensely against efforts to rethink or redirect program priorities. Opposition will be less effective if there is a clear vision of the role that telecommunication can play in promoting economic development.

Establishing formal goals is difficult. Goals focus on the question of how scarce resources should be distributed among competing groups and organizations. By not questioning goals, or by referring to them in broad terms, decisionmakers can avoid accountability to stakeholders who are losers in the goal-setting process.

It will likely be difficult to set a goal for making communication a priority in the economic development process. A consensus has not developed in the United States to support the notion of communication as infrastructure. There is an unawareness of the potential role of new communication technologies in the development process, and skepticism about its effectiveness. A few years ago, former Federal Communications Commission (FCC) Chairman Fowler equated television sets with toasters, a comparison, he said, implying that communication services should be treated like any other commodity to be bought and sold in the marketplace. This narrow view is shared by many consumers, regulators, and economists.

Being too cautious is a serious drawback. Most successful programs that have had a decidedly positive impact on rural America—such as the land-grant college system and agricultural extension, or the Rural Electrification Administration—have all been major national efforts, inspired by a larger vision.

Although the Federal rural economic development legislation enacted by the 101st Congress acknowledges the importance of and provides a specific role for communications in the development process, the bill takes a cautious approach. The Rural Economic Development Act of 1990 seeks to assure that modern communication technologies are available in rural areas by making it easier for rural telephone providers to borrow money from the Rural Electrification Administration (REA) and the Rural Telephone Bank to modernize their networks. It also calls for these borrowers to play a more active role in rural economic development. The Act further envisions the use of communication technology to achieve other economic development goals, such as improving educational and medical resources.[7] However, the Act does not provide a clear picture of the role of technology as a central force in the development process.

Being too cautious is a serious drawback. Most successful programs that have had a decidedly positive impact on rural America—such as the land-grant college system and agricultural extension, or the Rural Electrification Administration—have all been major national efforts, inspired by a larger vision.

An overly conservative approach to communication technologies could undermine the chance to make a real difference. Where communication technologies have been effective, it has often been because they served not only as more efficient means of providing basic services, but also as catalysts for innovation—for actually changing the way that things get done. People in rural areas, however, are limited in their ability to creatively apply new technologies to problems of development. They lack an adequate, low-cost communication infrastructure and the skills and experience required to optimally use it. This situation contrasts with urban areas where there is a "critical mass" of both technology and sophisticated users, which stimulates new applications and additional use. To create a "critical mass" in rural America will require a significant commitment and the willingness to take substantial risk.

Ways To Achieve Flexibility and Encourage Creativity

Policies designed to allow flexibility and encourage creativity are needed to accommodate rural America's diversity and limited experience using communication technologies to promote economic development. If communication technologies are to benefit rural communities, the 10 criteria listed above must be met. Fulfilling these criteria will require strong national leadership. The challenge for policymakers is to strike a balance between flexibility and forceful national leadership.

To achieve this balance, two different approaches have been used in the past: 1) providing block grants to the States with programmatic strings attached; and 2) establishing agencies at the State and local levels charged with administering a federally based program. The second of these two approaches is the preferred as it applies to the goal of promoting information-age technology for rural economic development. Unless the Federal Government establishes the guidelines for a technology-based program, many of the criteria needed for successful development are unlikely to be met.

The Block-Grant Approach

Block grants have been used to distribute Federal funds for health, education, and human services. This approach is increasingly being used for other funding, including rural economic development programs. For example, the Rural Economic Development Act authorizes pilot testing of an institutional framework for distributing rural economic

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[7] For example, Subtitle B, Enhancing Human Resources, provides "incentives for local telephone exchange carriers, rural community facilities and rural residents to improve the quality of phone service, to provide access to advanced telecommunications services and computer networks, and to improve rural opportunities."

It is at the State level that many development programs are coordinated and priorities set.

development funding through State governments in up to five States. It establishes a new process to deliver grants and loans by creating State Rural Economic Development Review Panels[8] and/or Rural Investment Partnerships.[9] These panels would rank applications for assistance according to State needs, and allow flexibility to transfer certain rural development funds from one program to another.

Although the Secretary of the U.S. Department of Agriculture need not accept the recommendations of the State Review Panels, the Secretary would have to notify the Review Panel and the Chairmen of the Senate and House Agriculture Committee if funding decisions differed from those recommended.

State and local governments strongly favor a decentralized approach that would give them considerable control over the allocation of Federal funds. Grants and loans to the States and localities provide flexibility, allowing programs to be tailored to the specific needs of a State or local area. They also permit diversity, and the learning that comes from experimenting with different approaches. Involving State governments in the process also helps assure their commitment to Federal programs. It is at the State level that many development programs are coordinated and priorities set. State support and leadership will be essential to promote unconventional and untried development programs that rely heavily on communication technologies. Moreover, State public utility commissions set most of the regulatory policies affecting rural economic development. Therefore, it will be the State governments that must reconcile economic development and regulatory policies and goals.

Although favorable to the States, block-grant programs may not allow room for sufficient Federal leadership. As more responsibility is shifted to the States, the Federal Government will find it more difficult to assert leadership, guide programs, or meet national priorities. Without strong Federal leadership, many prerequisites for successful development will not be met.

For example, with a block-grant program, it would be difficult to assure that States pursue development approaches based on the use of communication technologies. Established interests are well-positioned at the State level to vie for Federal funds. But there are few constituent groups to speak on behalf of using communication technologies as a development tool. Nor are many State officials either well versed in the use of technology or aware of the development opportunities and choices that it offers. In general, States will find it difficult to provide the entrepreneurship or vision required to overcome entrenched interests and the traditional ways of doing things.

Block grants are unlikely to provide either sufficient incentives to encourage holistic approaches to development or sanctions to discourage States from simply "writing off" their most depressed communities.

Block grants are also unlikely to provide either sufficient incentives to encourage holistic approaches to development or sanctions to discourage States from simply "writing off" their most depressed communities. Many States focus their development efforts exclusively on the business sector, and they favor those regions in their States that offer the most commercial promise. This tendency is likely to be more prevalent in the future as States compete even more intensely to attract new businesses and jobs. Communication technologies will be underutilized, serving only a narrow set of business interests, while other important aspects of community development founder.

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[8] The partnerships would provide local revolving funds for rural development, with Federal seed money available to State and local government and nonprofit public or private rural economic development agencies.

[9] The "Rural Partnership Investment Board" would be composed of the Administrators of the Rural Electrification Administration, Rural Development Administration, and Extension Service plus two other members appointed by the President. The Board would provide Federal lines of credit; local agencies administering the funds would make the investment decisions.

If the Federal Government is to pursue a development program based on block grants, it must assure that States have the technical capacity to make educated decisions about the use of technology. Moreover, funding would need to be made conditional on its use for specific purposes.

A Federal Program Administered at the State Level

One way to provide both Federal leadership and flexibility at the local level is to build on the successful model of the Cooperative Extension Service. Through this program the Federal Government played a major role in transferring industrial technology to agriculture. Cooperative Extension was successful because it relied on participative, self-help programs—farmers working together with experts and officials to solve problems.

An equivalent program today would be a Rural Development Service, whose basic mission would be to encourage the use of communication technologies for development purposes. As in the case of its agricultural model, administrative units would be established at the Federal, State, and local levels, but program activities would vary from State to State and within States. Decisions would be worked out locally and flow upward through the system to the State level. Subject matter specialists, who might be employed by land-grant institutions, would help local development officials incorporate communications into their programs. Supervisors and State leaders would assist in program planning, budgeting, and public relations. The Federal Government's role would be largely one of consultation and leadership, rather than of direct management or control.

This option would signal a true commitment to promoting rural development through information-age technologies. It is also a proven method for technology transfer, a major need for a successful program. The previous success of this kind of a program suggests it is likely to have a considerable payoff.

States, however, may not favor this approach, especially if it is seen as an alternative to receiving block grants. Many State leaders may not view telecommunications as a major priority. Others may simply want to control funds spent within their jurisdictions. One way to overcome such resistance would be to separate out Federal funding for telecommunications programs from other grants and to link these funds to State support and commitment.

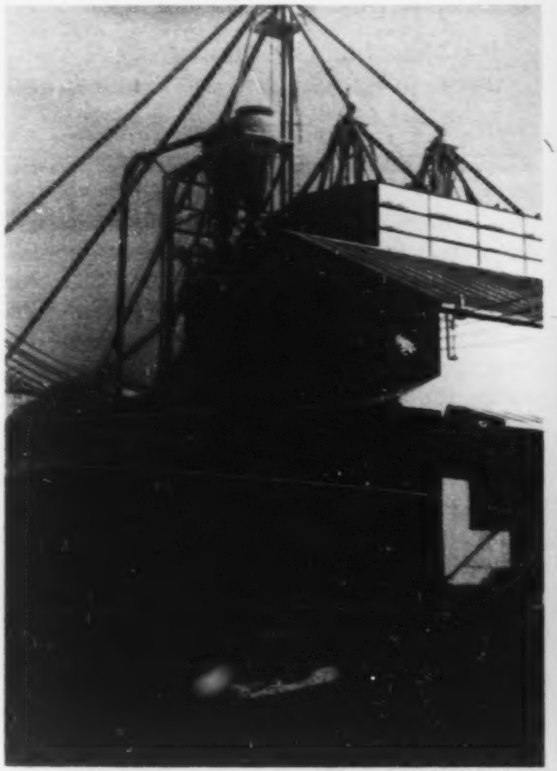


Photo credit: Mark G. Young

The farm bureau and cooperative in Page, VA.

This approach may be difficult to execute through existing organizations. Even within Federal agencies, there is little understanding of communication technologies and their potential. Success will depend on how willing and able agency employees are to improve their technical knowledge or to hire those knowledgeable in this area. If new organizational arrangements are required, the cost of pursuing this option will be greater.

Taking Advantage of Existing Organizations

A national program to encourage the use of information technology for rural economic development will be less costly if existing organizations are given charge of its direction and implementation. There are a number of organizational candidates for this task, including a wide variety of agencies and institutions involved in development activities at the Federal, State, and local levels. Each, however, is generally responsible for only one piece of the development puzzle. Thus, the problem for policymakers is not to establish new institutional arrangements, but to assign agencies tasks that match their existing strengths and to assure that cooperation and coordination among these agencies provides a holistic development approach.

There are at least three organizations that could be considered for major rural development roles (see figure 1-6). These include the United States Department of Agriculture, the Rural Electrification Administration, and the State land-grant colleges and university systems.

The United States Department of Agriculture

The Department of Agriculture (USDA) is responsible for coordinating rural policy, and chairs the interagency committee on rural development that operates under the auspices of the White House Economic Policy Council. Over the last few years, it has made a concerted effort to expand its focus beyond agriculture-related issues to include more general economic development issues affecting rural areas. Several USDA agencies now have important rural development responsibilities—principally the Farmers Home Administration, the Rural Electrification Administration, and the Cooperative Extension Service, and—to a lesser extent—the Forest Service, Soil Conservation Service, Economic Research Service, and the National Agricultural Library.

If USDA is to play a commanding role in rural development, even greater leadership and coordination is needed. Title XXIII of the Rural Economic Development Act of 1990 (Public Law 101-624) reorganizes the Department of Agriculture to do this by creating the Rural Development Administration alongside the Farmers Home Administration to be vested with primary responsibility for rural economic development policy.

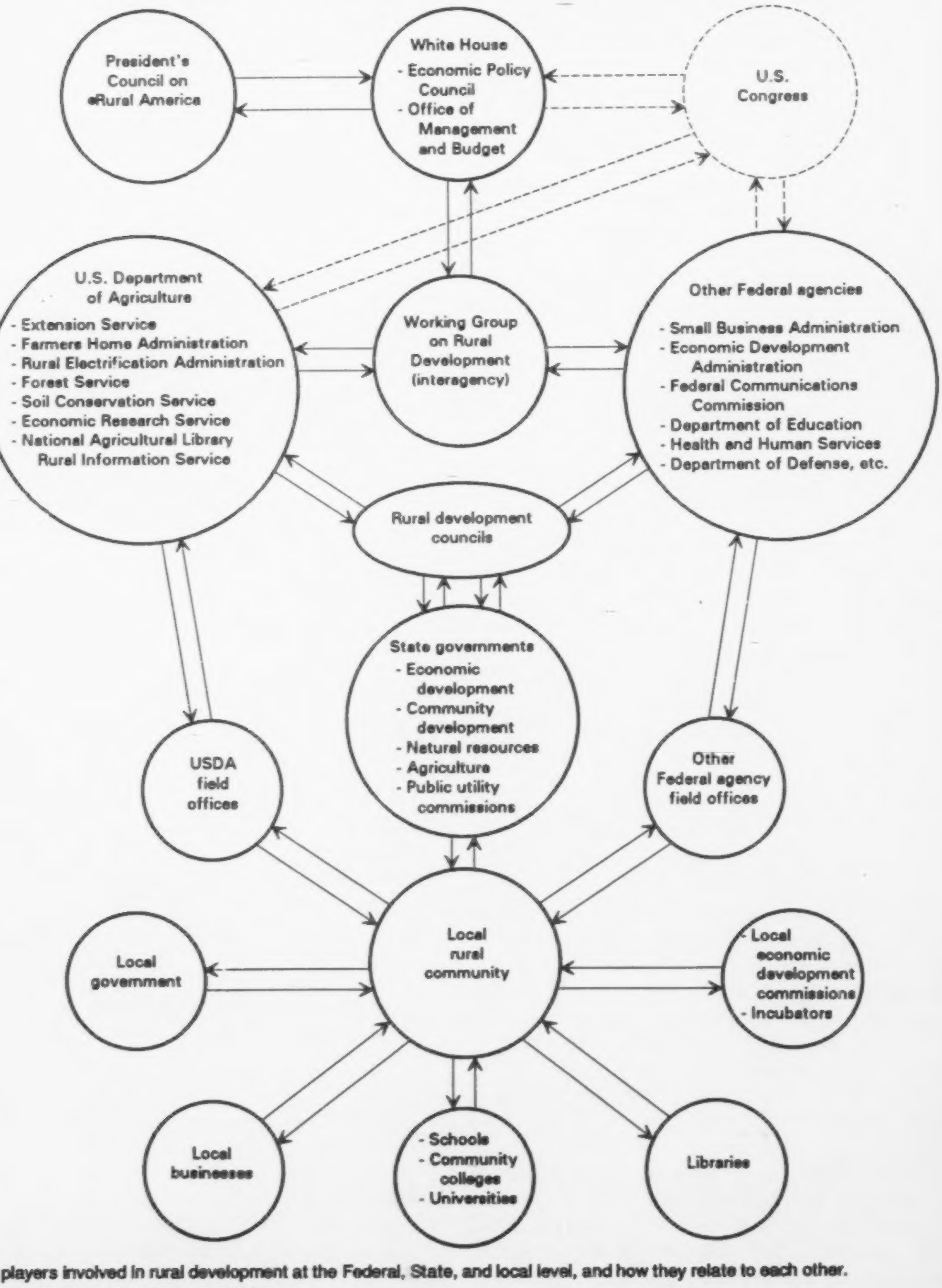
Within USDA, the Economic Research Service conducts research on rural areas, and its work has identified and explained the underlying causes of rural America's recent decline. Further research, monitoring, and examining the role of communication in the development process at the local level could also be fruitful. Section 2349 of the Rural Economic Development Act provides research grants for the purpose of further studying rural development. In addition, it directs the National Rural Information Center Clearinghouse operated by the National Agriculture Library to maintain and disseminate information on various leadership training programs, as well as information on participants involved in rural development. The listing is to include information about rural electric cooperatives; nonprofit business development companies; economic development districts serving rural areas; small business development centers; regional development organizations; vocational or technical schools; and Federal, State, and local agency programs.

If the Cooperative Extension Service is to play an expanded role in introducing information-age technology to rural areas, it must be reenergized and develop greater technical expertise, especially at the grassroots level.

The Cooperative Extension Service is part of the Department of Agriculture. This program is uniquely suited to help introduce information-age technologies to rural areas where unfamiliarity and lack of experience with communication technology is a major barrier to its use. Knowledge is rarely transferred passively. Moving innovations from development to production is not a one-way process. The experience and understanding of potential users is as important to the process as is expert knowledge. Thus, effective technology transfer requires outreach programs based on mutual trust and respect, similar to those administered by the Cooperative Extension Service.

However, while the Cooperative Extension Service has a rural development strategy at the national level, at the grassroots level it is often not perceived as a vital institution, with an important mission to fulfill. Instead, it is viewed as lacking creativity and initiative, and focused on agriculture to the exclusion of other kinds of rural development problems. Federal Extension Service officials, now more aware of the potential role for communication technologies in the development process, are developing an

Figure 1-6—Organizational Chart of Agencies Involved With Rural Development


President's Council on Rural America
White House
- Economic Policy Council
- Office of Management and Budget
U.S. Congress
U.S. Department of Agriculture
- Extension Service
- Farmers Home Administration
- Rural Electrification Administration
- Forest Service
- Soil Conservation Service
- Economic Research Service
- National Agricultural Library Rural Information Service
Working Group on Rural Development (interagency)
Other Federal agencies
- Small Business Administration
- Economic Development Administration
- Federal Communications Commission
- Department of Education
- Health and Human Services
- Department of Defense, etc.
Rural development councils
State governments
- Economic development
- Community development
- Natural resources
- Agriculture
- Public utility commissions
USDA field offices
Other Federal agency field offices
Local rural community
Local government
- Local economic development commissions
- Incubators
Local businesses
- Schools
- Community colleges
- Universities
Libraries

The key players involved in rural development at the Federal, State, and local level, and how they relate to each other.

SOURCE: Office of Technology Assessment, 1991.

overall information technology plan.[10] But the knowledge gap at the local level is great. If the Cooperative Extension Service is to play an expanded role in introducing information-age technology to rural areas, it must be reenergized and develop greater technical expertise, especially at the grassroots level. It also must work more closely with other rural development agencies, such as the Rural Electrification Administration, the Economic Development Administration, the Small Business Administration, and statewide university systems (see ch. 6).

The Rural Economic Development Act of 1990 takes steps to enhance the role of the Cooperative Extension Service. Section 2346 establishes a rural economic and business development program within the Extension Service. Funds are provided for State and county-level Cooperative Extension Service rural development specialists to:

> Assist individuals in creating new businesses, including cooperatives, or assist existing businesses, and to assist such businesses regarding advanced telecommunications, computer technologies, technical or management assistance, business and financial planning, and other related matters, and to assist community leaders in community economic analysis and strategic planning.

Rural development specialists would provide:

> Advanced telecommunications, business management, computer operations, and other technical assistance to community leaders and private sector entrepreneurs and cooperatives.

The Extension Service is also directed to coordinate and cooperate with any similar service provided by other Federal agencies or programs.

The Rural Electrification Administration (REA)

Like the Cooperative Extension Service, the REA has a long and successful history serving rural communities. Its basic charge was to foster technology deployment through a low-cost Federal loan program. Communication services in rural areas would have lagged greatly had rural telecommunication providers not used REA loans.

Although the REA program has helped rural telephone providers make strides in upgrading the rural communication infrastructure, there is still much for REA to do. Many areas continue to have poor-quality service. Many do not have single-party access to the public switched network, equal access to competitive long-distance carriers, access to value-added data networks, emergency 911 service or touch tone and customized calling services. Moreover, rural communication needs are likely to increase greatly in the future due to the rapid advance of technology and the importance of communication in modern life. Experience suggests that advanced technologies will not be quickly deployed to rural areas without some form of government intervention.

REA could help rural communities and development agencies serving rural areas sort out their communication needs and explore new ways of meeting them.

There are also new roles that REA could play in the post-divestiture communication environment. Most important, REA could help rural communities and development agencies serving rural areas sort out their communication needs and explore new ways of meeting them. If rural areas are to benefit from new technologies, they must develop alternatives for organizing and financing their communication networks. Fortunately, technological advances and the unbundling of the communication infrastructure permit all users to develop customized communication systems that meet their unique needs.

With its successful lending experience and technical expertise, REA could play a key role in helping to launch such experimental approaches. The REA could establish forums and discussion groups of community leaders, communication providers, and communication users to consider rural communication needs, and explore how communication systems might be designed to meet these needs. In a more proactive mode, REA might conduct research and development to investigate new and creative ways of deploying advanced communication and information technologies to rural areas, and/or provide financial support for demonstrations and trials of such strategies. The REA could serve as an honest broker between borrowers and potential users. It could also provide loans and technical assistance to groups of users and providers who undertake cooperative communication ventures.

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[10] For a discussion of this plan see ch. 6.

The Rural Economic Development Act of 1990 includes measures to expand REA's role in several of these respects. Section 2350 creates a new REA Assistant Administrator for Economic Development to carry out REA programs that involve rural electric and telephone systems in community and economic development. This section mandates REA to spend 10 to 20 percent of its annual budget on development activities, and not less than 1 percent on a "technical assistance unit" to provide advice and guidance to REA borrowers concerning community and economic development. Section 2345 provides the REA Administrator with additional powers and assigns duties to provide advice and guidance, establish and administer pilot projects and demonstrations, and act as an information clearinghouse for dual development-related activities of REA borrowers. REA's technical assistance role is strengthened across the board.

The Act reaffirms the continuing importance of the REA loan program, and calls on it to play an even greater role. Public Law 101-624, for example, finds that:

> Making modern telecommunications technology and services available in rural areas in the United States promotes economic development and improves the quality of life in rural areas, and the efficient operation of the Rural Telephone Bank and the Rural Electrification Administration loan program is essential to the continued development of the telecommunications infrastructure in rural areas.

The Act extends lending authority to advanced telecommunication services; mandates the expeditious processing of loan applications and the use of available loan funds to the extent authorized by law; and prohibits, in the strongest possible terms, any further attempts to dismantle or weaken REA and REA telephone programs. In addition, Section 2101 of Title XXI establishes a technical assistance unit within REA to provide advice, guidance, and information to REA electric and telephone borrowers concerning rural development programs, activities, and projects. It also directs REA to "promote local partnerships and other coordination between borrowers under this Act and community organizations, States, counties, or other entities, to improve rural development."

The REA is well-suited to assume leadership in planning for, and supporting, rural communication networks for the future.

The REA is well-suited to assume leadership in planning for, and supporting, rural communication networks for the future. Moreover, the creation of an economic development office within the REA is consistent with the criteria calling for a joining of economic development and technology policy. However, REA is likely to be most effective when focusing on technology issues. As it now stands, it has neither the staff nor the resources to play a major economic development role. Thus, it may be best not to recast REA into a full-blown rural development agency, for which it is ill equipped, but instead to direct REA to work closely with other agencies, focusing and providing expertise and advice on the many new and challenging technology issues emerging in a post-divestiture environment.

Dispersed throughout rural areas, institutions of higher education provide an ideal hub, not only for rural communication networks but also for bringing together the myriad of players needed for economic development.

Community Colleges, Land-Grant Universities, and State University Systems

Although colleges and universities played a critical role in helping Americans adjust to the shift from an agricultural to an industrial-based economy, they are sometimes overlooked as resources for rural economic development. In the Rural Economic Development Act, educational institutions are hardly referred to at all, at most being called on to play a coordinating, research, and/or limited implementation role.[11] This is a serious oversight. Dispersed throughout rural areas, institutions of higher education provide an ideal hub, not only for rural communication networks but also for bringing together the myriad of players needed for economic development.

Many colleges and universities already have computer/communication networks that are electronically linked to other institutions, libraries and databases, and research centers throughout the United States and the world. The future development of a high-speed national research and educational network (NREN) will provide universities even greater access to computing and transmission capacity, and information services. In addition, the number of educational institutions using communication technologies to develop and share educational resources and materials is growing at a steady pace. Many colleges now deliver at least some classes over the air or online to students at distant locations.

Having established their own communication networks and successfully used them to meet their educational goals, most educational institutions are knowledgeable in the use of communication technologies.

Having established their own communication networks and successfully used them to meet their educational goals, most educational institutions are knowledgeable in the use of communication technologies. As large users of communication services—often ranking second only to State government—they exert considerable market power. As in the case of a large business, the demand of a statewide university system can, by itself, justify the deployment of advanced technology even to a relatively remote area. Because of these strengths, educational institutions can play a key role in assuring the success of telecommunication-based development programs. Not only could they provide expertise, they could also leverage their market power to draw communication providers to rural areas (see box 1-F).

Colleges and universities also provide a locus for many of the key players involved in development. Businesses are now aligning themselves with educational centers to promote education, training, and research. They are also taking advantage of university online library systems and the growing number of applied research and development centers located at, or near, university centers. Similarly, many organizations involved in development are either housed at or near the university. For example, the Small Business Administration's (SBA) offices are generally located on university campuses. So too are many Extension Service's offices. Universities are also well connected to State governments, since many are governed by State boards and funded by the States.

Federal regulatory policies that aim to guarantee rural areas equal access to advanced technologies may founder because regulatory authority is divided between the Federal Government and the States.

Thus State colleges and university systems could contribute to the rural economic development process. Federal and State programs that do not include them will lose a powerful resource.

Reconciling Economic Development and Regulatory Policies

It is a mistake to use the regulatory system as the primary means for achieving rural economic development. Regulators and economic developers have different missions. They often view issues and judge policies in different terms. These differences are even greater in the post-divestiture, competitive environment. Regulators are committed to protecting individual consumers; economic developers to

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[11] The Act requires that any State Rural Economic Development Review Panels that may be established include nonvoting representatives from schools or colleges of business, engineering, and agriculture. Also, the Act establishes rural telecommunication access programs intended to improve the use of telecommunication and computer networks by rural students and teachers, among others. And education is to be included in rural development plans proposed for rural areas in participating States.

Box 1-F—Big Sky Telegraph

> *In Cody, a remote town in northern Wyoming, stands an old log house. What was once a mid-fifties Holiday Inn coffee shop now encloses the Big Horn BBS* [computer "bulletin board system"], *a rather unlikely location for a telecommunications system with global capabilities.*[1]

Ever since the inception of the Big Sky Telegraph at Western Montana College introduced the idea of linking citizens and communities through modem telecommunications, there has been a proliferation of BBSs around these Northern Mountain States, where people are spread over great distances.

Big Sky Telegraph, the inspiration and model for other bulletin board systems in Colorado, Wyoming, Idaho, and Nebraska, was first conceived as an electronic network to link Montana's 114 one-room schools to each other and to Western Montana College. With initial support from the M.J. Murdoch Charitable Trust and US West, Big Sky started operating—"went on line"—in January 1988. The Telegraph has gone beyond being "a resource support system and recertification program for teachers"[2] and its mission has since grown into "a rural educational, business, and individual telecommunications support service." About 100 community sites (including schools, libraries, county extension offices, chambers of commerce, women's centers, and hospitals) will be equipped with a modem to connect their computers to Big Sky's network. Circuit riders travel throughout the State to introduce people to the technology and familiarize them with its offerings, and local system operators are given training to help the community use the services.

The Big Sky Telegraph exemplifies how communication technologies serve to support human communication which ultimately and essentially serves to define and unite communities. Big Sky is a means of sharing ideas and information among communities with common circumstances and concerns and similar needs and opportunities—but which are separated by great distances. "The Big Sky Telegraph 'virtual community of communities' consists of frontierspeople from over 100 rural Montanan communities and statewide dispersed organizations working together to learn from each other survival techniques."[3]

The Telegraph is a tool for enhancing education, for broadening and strengthening community, for facilitating economic development, and for building grass-roots democracy. For example, several students are being taught a class in Chaos Theory from a professor at the Massachusetts Institute of Technology over the Big Sky Telegraph. In addition, the Telegraph will give subscribers to the system access to a greater range of external and foreign information sources such as national and international databases and computer bulletin boards.

Photo credit: Frank Odasz

Members of three tribes at work during Big Sky's recent project, the Native American Graphic workshop.

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[1] Lester Santos, "The Conception and Development of the Big Horn Community Business BBS," unpublished paper.

[2] MESA Consulting, "Telecommunications and Rural Economic Development," prepared for United States Telephone Association, October 1990.

[3] David Hughes, "On the Trail to the Rural Global Trade Frontier: Tales From the Telecom Trappers Council," unpublished paper.

SOURCES: Big Sky Telegraph, "Telecommunications Guide to Community Action," © Frank Odatz, University of Montana, Western Montana College; David Hughes, "On the Trail to the Rural Global Trade Frontier: Tales From the Telecom Trappers Council," unpublished paper; Lester Santos, "The Conception and Development of the Big Horn Community Business BBS," unpublished paper; MESA Consulting, "Telecommunications and Rural Economic Development," prepared for United States Telephone Association, October 1990.

Communication policies now being debated and decided will determine when, and to what extent, rural areas have access to modern communication technologies.

fostering broader societal goals. Whereas regulators tend to assess the need for deploying new communication technologies on the basis of a demonstrated market demand; economic developers tend to evaluate the benefit in terms of technology's potential to address a social problem.

Federal regulatory policies that aim to guarantee rural areas' equal access to advanced technologies may founder because regulatory authority is divided between the Federal Government and the States. Even when the Federal Communications Commission adopts policies to encourage the modernization of the communication infrastructure—as in the case of setting depreciation rates[12]—States may not follow suit. Recent court decisions have circumscribed the FCC's authority to preempt the States in such instances.

Despite the problems entailed in relying on regulation, rural economic development must take telecommunications policy and regulatory policy goals into account. Communication policies now being debated and decided will determine when, and to what extent, rural areas have access to modern communication technologies. Thus, if communication-based rural economic development policies are to succeed, the conflict between economic development and communication regulations must be reconciled. There is too little attention being paid to these issues. The recently enacted Rural Economic Development Act, for example, does not address the potential communication regulatory issues that the legislation might cause, nor does it suggest ways to resolve them.

Several steps might be taken to remedy this situation:

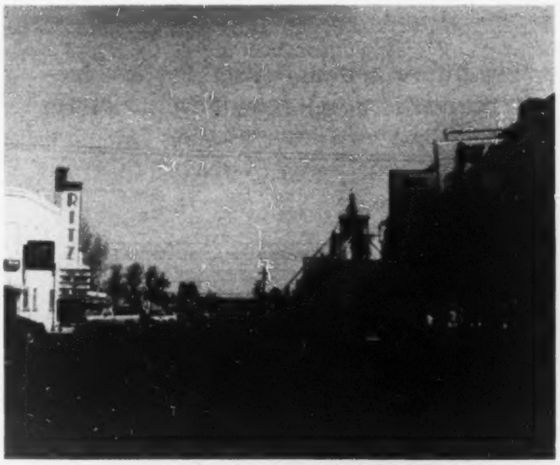

Photo credit: Mark G. Young

A view of the main street in Ritzville, Washington, a community heavily dependent on agriculture.

1. establish institutionalized ways to improve communication between economic development policymakers and regulators,
2. take better advantage of the Federal/State joint board (see below) to resolve differences on technology deployment,
3. give regulatory agencies authority to include development goals in their evaluations,
4. pursue technology deployment strategies that are likely to work through—not against—market forces, and
5. set regulatory policies that distinguish rural from urban areas.

Establish Institutionalized Ways To Improve Communication Between Economic Development Policymakers and Regulators

Regulators and policymakers involved in economic development would better understand each other's values and goals if they routinely met to discuss overlapping issues. A typical way of promoting such discussion is to set up an interagency

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[12] Beginning in 1980, the FCC adopted a number of changes with respect to determining depreciation rates that were designed to take into account advances in technology. This step led, however, to conflicts with the State public utility commissions. The Supreme Court supported the States' rights to an independent position, ruling—in the case of *Louisiana Public Service Commission* v. *Federal Communications Commission*—that in the 1934 Communication Act, Congress did not want to preempt the States on depreciation issues generally.

Regulators and policymakers involved in economic development would better understand each other's values and goals if they routinely met to discuss overlapping issues.

committee.[13] In this case, an interagency group might be established between the Federal Communications Commission (FCC) and the Rural Development Administration within USDA. Interagency committees are often formed for expedience.[14] They seldom reach consensus; but they can promote shared understanding. Such arrangements are rarely satisfactory, so interagency committees should be viewed as a complement to other mechanisms.

Some of the shortcomings of interagency committees are that they tend to obscure problems rather than resolve them, subvert the political interest and commitment to addressing problems because there are too many people with peripheral interest, and seek outcomes based on a distribution of power instead of policy needs.[15] Mission agencies often oppose such coordination and set out to assure that they fail. As Harold Seidman has noted, efforts at coordination are not designed to make friends, for "coordination is rarely neutral," and always "advances some interests at the expense of others."[16] Thus, any proposal to improve coordination is often judged less on its merits than on how it might redistribute power among existing players.

Interagency groups work best when aiming towards established goals. They may be only marginally effective in resolving rural economic development/telecommunication policy issues unless the goals are clearly stated. Interagency committees should not be discounted, however. Without a dialogue between policymakers in both development and regulation, it may not be possible to find solutions.

Utilize Joint Federal/State Boards To Foster Communication Among Federal and State Regulators About Meeting Rural Communities' Communication Needs

States are pursing a number of different approaches to reduce the tension between economic development and regulatory goals. Some of these conflict with the policies and approaches of the FCC. Sharing experiences on the State and Federal levels through a joint forum might help reconcile and resolve jurisdictional issues.

The Federal/State Boards sponsored by the FCC and the State public utility commissions may be appropriate forums for these discussions. The boards consist of three FCC commissioners and four State commissioners nominated by the National Association of Regulatory Utility Commissioners. They consider divisive State-Federal issues and bargain in ways similar to contract negotiations. Most participants agree that the joint board process has been useful.[17]

If rural economic development is considered a major national goal, Congress could direct FCC to also consider social goals in its evaluations.

Give Regulatory Agencies Authority To Include Development Goals in Their Evaluations

Regulatory agencies are constrained by law as to the criteria they can apply to regulatory decisions. For example, some State regulatory commissions are prohibited from considering anything but technology cost/benefits and may not include social costs and benefits. This makes it impossible to account for economic development goals in regulatory decisions. Even in cases where consumers may benefit socially, regulators' choices are limited. Some States—such as Michigan—have passed laws authorizing their State regulators to incorporate social goals in their analyses to avoid this obstacle. If rural economic development is considered a major national goal, Congress could direct FCC to consider social goals in its evaluations. The FCC is now prohibited from actively supporting economic development. Congress has been reluctant to act on communication issues. If this reluctance continues, a change in FCC's authority is unlikely.

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[13] Today, two intergovernmental agencies are concerned with communication and communication-related issues: The Senior Interagency Group on International Communication and Information Policy, which was established by the National Security Council in 1984; and the Economic Policy Council, which, although it does not directly focus on communication issues, provides an interagency forum for addressing them.

[14] As Harold Seidman has described them, "Interagency committees are the crabgrass in the garden of government institutions. Nobody wants them, but everyone has them. Committees seem to thrive on scorn and ridicule, and multiply so rapidly that attempts to weed them out appear futile." See, Harold Seidman, *Politics, Position, and Power: The Dynamics of Federal Organization* (New York, NY: Oxford University Press, 1980), p. 270.

[15] Alan Schick, "The Coordinating Option," in Peter Szanton, *Federal Reorganization: What Have We Learned?* (Chatham, NJ: Chatham House Publishers, 1981), p. 95.

[16] Seidman, op. cit., footnote 14, p. 205.

[17] Richard Schultz, "Two-Tier Regulation and Joint Boards in American Telecommunications," unpublished manuscript, July 1987.

Encourage Technology Deployment Strategies That Will Work Through—Not Against—Market Forces

Regulators do not disagree with social goals per se, but they generally oppose policies that circumvent market forces or that distort market signals. They encourage modernization programs that are driven by demand, rather than technology. Economic development strategies that create demand are consistent with regulatory policies. For example, strategies that combine users' needs and create the demand needed to financially justify the rapid deployment of advanced communication technologies will meet regulatory criteria.

Changes will require government intervention. Consumers act as individuals in the market, with no incentive to join together. Consumers may not recognize their common interests in rural areas where communication expertise is limited. Government could provide incentives to assist consumers through information sharing and/or loans and grants. The REA could play an important role in providing technical assistance.

Section 2334 of the Rural Economic Development Act encourages joint use and sharing of telecommunication transmission facilities through grants to end users. The Act also streamlines the process for granting telephone carrier loan requests and requires grant applicants to work with local telephone carriers. Section 2337 creates a loan program for business telecommunications partnerships to help rural businesses and governments share telecommunications terminal equipment, computers, and computer software.

Although consistent with regulators' compulsion to work through the market, a cooperative approach could still raise regulatory problems. A large and coordinated group of users could establish its own communication system and bypass the public network.

Regulatory Policies That Distinguish Rural From Urban Areas

Conditions in rural areas are dramatically different from those in urban areas. This difference requires different telecommunications strategies. Regulatory policies must be designed to reflect these differences. Policies that pertain to lower Manhattan in New York City are not likely suitable to Aroostook County, Maine. Whereas Manhattan can sustain three competing telephone companies, Aroostook County barely sustains even one modern communication system. Rate-of-return regulation, depreciation policies, alternative regulatory frameworks, cable/telco cross-ownership, telephone companies entry into information services, and LATA boundaries and exchange boundaries require special treatment for rural areas. To address these policies, Federal-State jurisdictional conflicts must be resolved, and sensitivity to rural needs must be nurtured among regulators.

Federal-State jurisdictional conflicts must be resolved, and sensitivity to rural needs must be nurtured among regulators.

Creating Incentives for Cooperation

Communication-based economic development programs are likely to have substantial long-term benefits. But some stakeholders may feel threatened. Agencies may try to protect their turfs or may lack the willingness to acquire the technical know-how. Telephone service providers might be concerned that users bypass their communication systems. State development officials may resent loss of control over development funding. Local development groups may resist new programs seeking a share of development funds. The cooperation needed for rural success is unlikely in such a competitive atmosphere. The Federal Government must promote cooperation among stakeholders by using its leverage through grants and loans.

Educators lead in developing this kind of cooperative approach. Under the Star School Program, for example, $33.5 million (in the form of 2-year competitive matching grants) is available to partnerships for using telecommunications for long-distance learning.[18] Taking advantage of a similar opportunity, the University of Maine/Telecommunications System used a 5-year, $4.4 million grant from the Department of Education under Title III of the Higher Education Act, matched by the State government, to help telephone providers pay for the upfront costs of deploying a fiber network linking State universities and community colleges.

A similar grant or loan program might be administered through the USDA's Rural Development Administration, which coordinates Federal activities in rural economic development. However, the interagency working group that exists within USDA should be expanded to include the Departments of the Interior and Defense and the FCC. Loans might be administered through the REA.

Government must promote cooperation among stakeholders by using its leverage through grants and loans.

If effective, these grants could have a very high payoff. Such grants could help establish self-sustaining relationships that promote cooperation and commitment among players. The Federal Government could guide the grant program through a competitive process. The Federal Star School Program identified the players that must be involved in developing educational partnerships, and targeted benefits for low-income groups; a rural grant program could similarly require that certain criteria be met.

Programs and partnerships developed under such a grant or loan program could prove threatening to rural communication providers, and cause some tricky regulatory problems. There are bound to be some failures with this unconventional approach. However, something can be learned from failure in such high-risk programs, and the experience gained can be built into later grants. Moreover, the rate of failure is likely to be less if this kind of program is implemented in conjunction with the necessary informational, technology transfer activities. Regulatory problems might also be resolved if Federal plans are discussed regularly with State regulators. Conflicts with local communication providers will be avoided, if they are participants in the development of any grant proposals, and thus have something to gain by their acceptance.

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[18] The Star Schools legislation specifies two formats for the composition of eligible partnerships. In one, membership must include at least one State educational agency, State higher education agency, or local education authority responsible for a significant number of poor or underserved students. Furthermore, this type of partnership is required to have at least two other institutions from a host of types, including universities, teacher training institutions, and public broadcasting entities. The other type of partnership must include a public agency or corporation already formed to operate or develop telecommunication networks to serve schools, teacher training centers, or other education providers. All partnerships must be statewide or multistate. These requirements were meant to create new paths to improve the educational system by fostering cooperation among institutions. For a further discussion, see *Linking for Learning*, OTA-SET-430 (Washington, DC: U.S. Government Printing Office, November 1989), pp. 136-141.

Chapter 2

The Challenge for Rural America

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Chapter 2

The Challenge for Rural America

Findings

Unless rural communities act decisively to reverse present trends, their economies will become more fragile. Without intervention, unemployment, poverty, and out-migration will likely increase, exacerbating the structural problems typical of rural areas. The growing importance of high-technology service industries within the economy and the higher value placed on employment in these fields, as well as greater environmental constraints, require that economic development strategies be broader-based while focusing more on such technology-oriented businesses.

To attract firms in these growth industries, rural areas will have a number of obstacles to overcome. Competition for such companies will be intense, coming from urban and other rural areas and increasingly from other countries. Unlike routine manufacturing industries that migrated to rural areas in search of lower production costs, today's high-technology industries are attracted both by a highly skilled workforce and communication networks to other economic markets and information centers. These are precisely what rural areas lack.

With these comparative disadvantages, it is clear that one key component of a successful development strategy is upgrading the labor force. A second component is the improvement of the communication infrastructures in rural areas.

Introduction

Although isolated and remote, rural communities do not exist in a vacuum. They are linked to the world surrounding them through a variety of transportation and communication networks and the commodities that flow over them.[1] Rural communities have, throughout American history, been shaped by advancements in transportation and communication technologies. By extending their ties and expanding their markets, these technologies have made rural communities more vulnerable to external developments and events.[2]

Photo credit: Mark G. Young

A microwave repeater looms over the back yards of Grants, NM, a uranium mining town that has endured the industry's booms and busts.

Rural America continues to evolve in response to its changing environment. Today, rapid advances in communication and information technologies are restructuring and redefining rural communities and markets. In the past, these technologies brought rural villages and towns into a larger, national community; now they link communities on a worldwide basis. As rural communities become even more interdependent, their futures will be determined by trends and developments far beyond their control.

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[1] Harold Innis, *The Bias of Communication* (Toronto: University of Toronto Press, 1951); see also James W. Carey, "Space, Time, and Communications: A Tribute to Harold Innis," James W. Carey (ed.), *Communication as Culture: Essays on Media and Society* (Boston, MA: Unwin Hyman, 1989).

[2] Ibid.

Many are concerned lest in this process rural America be left behind. Others believe that these social and economic changes could instead be a means to improve rural America's comparative advantages. Policymakers must have a clearer understanding of present conditions and the trends likely to affect rural communities in the future in order to evaluate rural communities' needs and prospects.

Defining Rural Areas

National rural economic development policies require a perceptive understanding of what the term rural America means—its location, its characteristics, its values. Present rural policy is not founded on such an understanding, so rural policies often reflect popular stereotypes instead of genuine needs.[3] One such stereotype equates rural areas with farming. As a result, a disproportionate share of Federal funds for rural areas targets farming, although only 8 percent of the people in rural areas farm, and fewer own their farms[4] (see figure 2-1).

These misperceptions persist, in part, because rural America is hard to define. Some policymakers use overly broad definitions deliberately, so they can appeal to a wide and diverse audience.[5] Others, who aim to be more precise, characterize rural areas in terms of the data available. Their definitions tend to be too constrained because reliable information about rural areas is limited.[6] Most definitions juxtapose rural and urban areas.

Two agencies in the Federal Government—the Bureau of the Census, within the Department of Commerce, and the Office of Management and Budget (OMB)—have defined rural areas. The Census Bureau defines rural areas by exclusion: all nonurban areas are rural. According to the Census, urban America includes urbanized areas and urban places. An urbanized area consists of a central city and the contiguous, closely settled area outside the city's political boundaries (the urban fringe) that together have a population of at least 50,000. Its boundaries are drawn to include all areas with a residential population density of at least 1,000 persons per square mile. People living outside urbanized areas, but in places with 2,000 or more residents, are also considered part of the urban population.[7]

The OMB divides the United States into two groups of counties: metropolitan counties (MSAs) and nonmetropolitan counties. An MSA typically contains either a city with 50,000 or more residents, or is an urbanized area as defined by the Census Bureau. All counties outside MSAs are considered to be nonmetropolitan (see figure 2-2).

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[3] For example, Jonathan Sher, a critic of past rural policy, complains that rural policy has shifted in accordance with two visions of rural America, the "bucolic" and the "bubonic." He notes, "During periods in which the bucolic view prevailed, the presumption was that everything was just fine in the countryside and therefore, governmental intervention constituted interference. This, in turn, allowed policymakers to feel comfortable about turning a blind eye towards rural issues. . . . [A]t other times the government pendulum swung to the opposite extreme. During the Great Society era, for example, some agencies and policymakers became transfixed by the bubonic image of rural people and their communities. Rural Americans were the People Left Behind and the self-appointed role of government was to save these backward folks. . . ." U.S. Congress, Subcommittee on Agriculture and Transportation, Joint Economic Committee, Jonathan Sher, "Rural Development Worthy of the Name," *New Dimension in Rural Policy: Building Upon Our Heritage*, June 5, 1986, pp. 515-516.

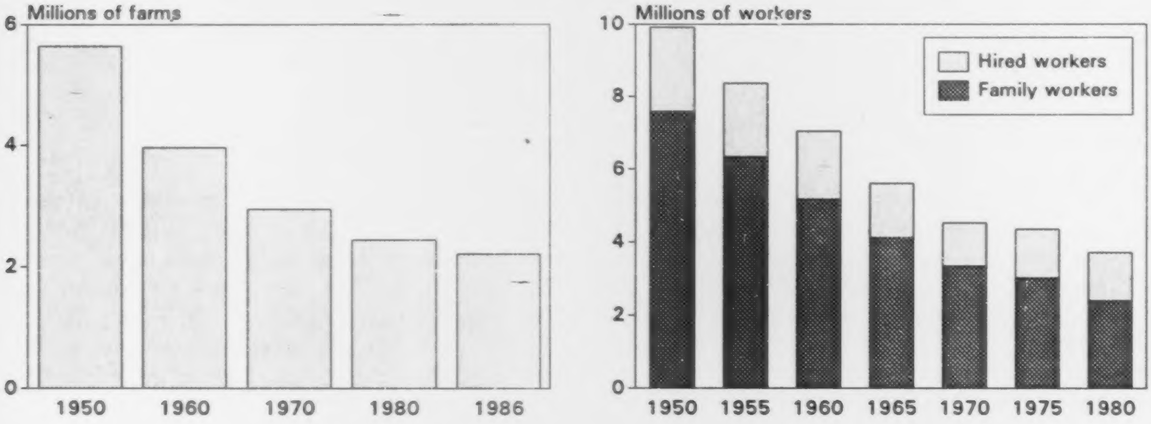
[4] In fiscal year 1987, $29 billion was spent on development programs for all of rural America, while $22.4 billion was spent on agricultural price and income support alone. Furthermore, a large proportion of agricultural subsidies were spent supporting the least needy farmers. In 1987, over half (57 percent) of direct government agricultural subsidies went to farmers who were in the top 15 percent in terms of wealth. See U.S. Congress, General Accounting Office, *Rural Development: Federal Programs That Focus on Rural America and Its Development*, Briefing Report to the Ranking Minority Member, Subcommittee on Conservation, Credit, and Rural Development, Committee on Agriculture, House Of Representatives, RCED -89-56 BR, January 1989, p. 29. See also, U.S. Department of Agriculture, *National Financial Summary*, 1988, *Economic Indicators of the Farm Sector*, Economic Research Service, ECIFS, 8-1, pp. 39 and 43.

[5] Consider for example the definition used in the policy report accompanying the Rural Development Policy Act of 1980. It states: "For the purposes of this document, the word 'rural' is used in general terms to describe geographic areas of relatively low population density—the countryside, the village, the small American town. . . Even within . . . areas of high population density, there are communities of distinctively rural character. It is this character, which resists precise definition in the abstract but is universally familiar in practical experience, that makes rural America a special place." John R. Block, Frank W. Naylor, and Willard Phillips, *Better Country: A Strategy for Rural Development in the 1980s* (Washington, DC: U.S. Department of Agriculture, Office of Rural Development Policy, 1983).

[6] It is quite expensive to collect the raw data on rural or nonmetropolitan areas. As a result, leading Federal agencies tend to collect less information about them. Moreover, as the National Academy of Science notes, "Our [factual] knowledge of rural people and their environment is imperfect and incomplete. [It consists mostly] of annual statistics for large aggregations of areas with only occasional benchmark data for census years for small areas. [And] aggregated data are often misleading because rural areas are so heterogeneous." As cited in, U.S. Congress, Joint Economic Committee, James T. Bonnen, "The Statistical Database for Rural America," *Towards Rural Development Policy for the 1990's: Enhancing Income and Employment Opportunities*, Washington, DC, S. Prt. 101-50, Sept. 14, 1989, p. 27.

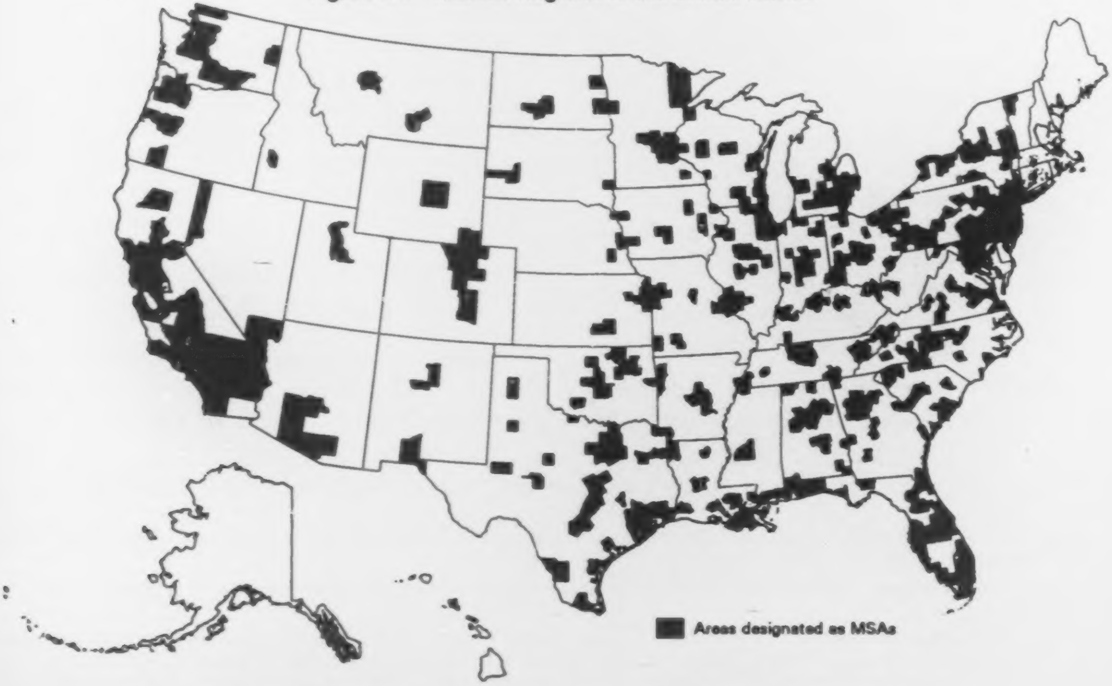
[7] U.S. Department of Commerce, Bureau of the Census, "Census and Geography—Concept and Products," *Factfinder*, CFF No. 8 (Washington, DC: U.S. Government Printing Office, August 1985).

Figure 2-1—Number of Farms and Farm Workers



SOURCE: Donn Reimund and Mindy Petrulis, "Performance of the Agricultural Sector," David L. Brown and Kenneth L. Deavers (eds.), *Rural Economic Development in the 1980's: Prospects for the Future* (Washington, DC: U.S. Department of Agriculture, 1988), pp. 81, 89.

Figure 2-2—Census Regions of the United States



SOURCE: U.S. Bureau of the Census, *1980 Census of Population and Housing* (Washington, DC: U.S. Government Printing Office, 1982), p. 52.

Table 2-1—ERS Classification of Nonmetropolitan Counties

	Size of urban population		
	Less than 2,500	2,500-20,000	More than 20,000
Adjacent to a metro county	rural adjacent	less urbanized adjacent	urbanized adjacent
Not adjacent to a metro county	rural nonadjacent	less urbanized nonadjacent	urbanized nonadjacent

SOURCE: David A. McGranahan et al., *Social and Economic Characteristics of the Population in Metro and Nonmetro Counties* (Washington, DC: U.S. Department of Agriculture, Economic Research Service, 1986).

Having two definitions is confusing because they are not always interchangeable. There are Census Bureau-defined rural areas that include parts of MSAs, and there are OMB-defined MSAs that encompass rural areas. In 1980, 40 percent of the rural population lived in MSAs and 14 percent of the MSA population lived in rural areas.[8] The census showed that 26.3 percent of the U.S. population lived in rural areas.[9] The sizes of the rural and nonmetropolitan populations, however, turn out to be roughly equivalent.[10]

For general policymaking purposes, OMB's definition of rural areas is preferred. There are more extensive data for counties than for rural or urban places. Both definitions are inappropriate, however, for a study that looks broadly at economic development issues. Neither captures the broad range of variables entailed in development.

One way to incorporate development-related variables is to differentiate rural communities according to their urbanization and proximity to urban centers. These two variables can be enlightening because access to urban areas is advantageous for development.[11] Rural areas close to urban centers have greater access to urban goods and services and, more importantly, to urban consumers.

The U.S. Department of Agriculture's Economic Research Service has created such a classification by subdividing nonmetropolitan areas into six categories (see table 2-1). This classification illustrates the geographic extent of the rural economic development problem. Figure 2-3 shows the distribution of nonmetropolitan counties for the years 1970 and 1980. In both time periods, there were fewer nonmetropolitan counties than urbanized counties. Less-urbanized counties—those with between 2,500 and 50,000 residents—were more common than either urbanized or rural counties, and rural nonmetropolitan counties were more urbanized than urbanized counties. Furthermore, the majority of nonmetropolitan counties were nonadjacent to metropolitan counties.[12]

Rural communities are much more than geographic entities. They are at one and the same time products of their pasts and incubators of their futures. In assessing the problems that rural communities face and their potential to overcome them, it is important to consider how the communities labeled "rural" have evolved.

The Evolution of Rural America in a Historical Context

In the earliest years, the United States was a Nation of small farmers. The farm was the mainstay of the preindustrial American economy, and the

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[8] Maria Hewitt, *Defining "Rural" Areas: Impact on Health Care and Research—Staff Paper* (Washington, DC: Office of Technology Assessment, July 1989), p. 13.

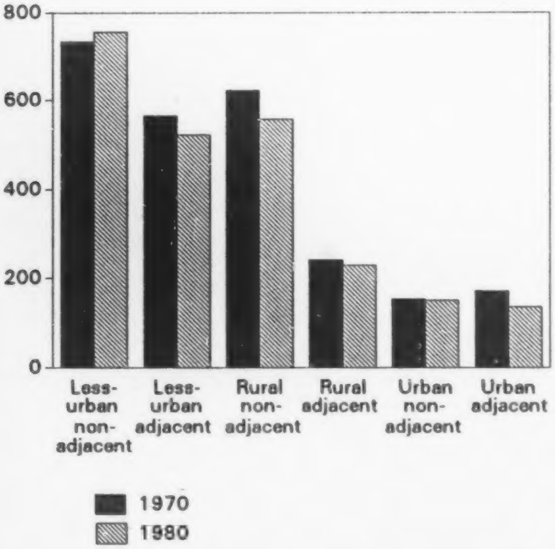
[9] "Characteristics of the Population," *1980 Census of the Population* U.S. Department of Commerce, Bureau of the Census (Washington, DC: U.S. Government Printing Office, 1981), pp. 1-37.

[10] U.S. Department of Commerce, Bureau of the Census, *State and Metropolitan Area Data Book* (Washington, DC: U.S. Government Printing Office, 1986), pp. 675-676.

[11] As rural sociologist Kenneth Wilkinson notes, "Distance is perhaps the most enduring characteristic of the quality we call 'rural' and distance impedes access. Access is essential for wellbeing and ruralness impedes access. These simple facts form the core of the rural problem, a problem found in virtually all societies and all regions." Kenneth P. Wilkinson, "Information Access in Rural Areas," unpublished paper, Department of Sociology, Pennsylvania State University, University Park, PA, September 1989, p. 2.

[12] The data also show a decline in the total number of nonmetropolitan counties between 1970 and 1980. This decline was heaviest among the urban adjacent nonmetropolitan counties, a number of which have become metropolitan counties, and rural nonadjacent counties, a number of which have grown in population. The decrease in the number of adjacent counties was due in part to different definitions of adjacency in 1970 and 1989. Margaret A. Butler, Population Section, Economic Research Service, personal correspondence, July 21, 1989.

Figure 2-3—Nonmetropolitan County Distribution



SOURCES: David A. McGranahan et al., *Social and Economic Characteristics of the Population in Metro and Nonmetro Counties* (Washington, DC: U.S. Department of Agriculture, Economic Research Service, 1986) Rural Development Research Report No. 58, p. 3; Margaret Butler, Population Section, Economic Research Service, U.S. Department of Agriculture, personal correspondence, July 21, 1989.

attitudes of the farm community reflected those of the people at large.[13] Most rural communities were self-sufficient.[14] Together they sustained the livelihood and well-being of most agricultural trade centers. In fact, it was the agrarian economy that defined town boundaries.[15]

Social life within farm communities was also self-contained. The provision of services was unspecialized. The community provided the institutional context in which families organized to worship and educate their children. Members of each community relied on their families and other local institutions to cushion the hardships of rural life.[16]

Farms were also viewed as the building blocks of democracy.[17] A high political value was attached to their continued well-being and the lifestyle they engendered. This perspective—epitomized by the views of Thomas Jefferson—presumed a "causal connection between the occupation of farming and the political system of democracy."[18] Jefferson's vision of a nation comprised of small independent farms was enthusiastically embraced by a burgeoning constituency of yeomen farmers in the Middle Atlantic and Southern States. As these farmers and their counterparts in the emerging West began to vote, the idealization of farm life became a potent political idea.[19]

Rural America was transformed by two major events—the industrial revolution and the American Civil War. Both events greatly increased the demand for agricultural products. With the adoption of land- and labor-saving technologies to meet this rising demand—often financed by external sources—the American farm became commercialized.[20] As commercialization proceeded, the size and value of farms increased, while their number declined. The disappearance of the family farm undermined the viability and independence of rural communities.

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[13] Grove Hambridge, "The Nature and Magnitude of Changes in Agricultural Technology," Richard Rodenfeld et al. (eds.), *Changes in Rural America: Causes, Consequences, and Alternatives* (St. Louis, MO: The C.V. Mosby Co., 1978), p. 9.

[14] According to Louis Swanson, these communities were "self-contained production-consumption units. The quality of these material conditions reflected their own labor and technical capacities, which were usually limited to local natural resources and artisan skills." Louis Swanson, "Rethinking Assumptions About Farm and Community," A.E. Luloff and Louis E. Swanson (eds.), *American Rural Communities* (Boulder, CO: Westview Special Studies in Contemporary Social Issues, 1990), p. 21.

[15] Ibid.

[16] As Douglas Ensminger describes: "In the early development of neighborhoods and communities in the United States, one of the first patterns created by families living in a localized area was that formed by the grouping of twelve to forty families primarily for protection and mutual aid. These early groups were forerunners of today's neighborhoods, and they soon provided the nucleuses through which families organized for religious worship and for the education of their children." Douglas Ensminger, "Rural Neighborhoods and Communities," Rodenfeld et al., op. cit., footnote 13, p. 295.

[17] Witney A. Griswold, *Farming and Democracy* (New Haven, CT: Yale University Press, 1952).

[18] Ibid., p. 19.

[19] As Grove Hambridge points out, "The opening of new lands and the westward expansion between 1790 and 1850 was marked by one of the greatest migrations in the history of the world. In 1790 there were 4,000,000 people in the United States, of whom 94 percent were in the 13 original States; within 60 years there were 23,000,000 people and 32 States." Grove Hambridge, "The Nature and Magnitude of Changes in Agricultural Technology," Rodenfeld et al., op. cit., footnote 13, p. 11.

[20] As the *Prairie Farmer* depicted in 1869, "The old rule that a farmer should produce all that he required, and that the surplus represented his gains, is part of the past. Agriculture, like all other business, is better for its subdivisions, each one growing that which is best suited to his soil, skill, climate and market, and with its proceeds purchas[ing] his other needs." As quoted in Paul H. Johnstone, "On the Identification of the Farmer," *Rural Sociology*, vol. 5, March 1940, p. 39.

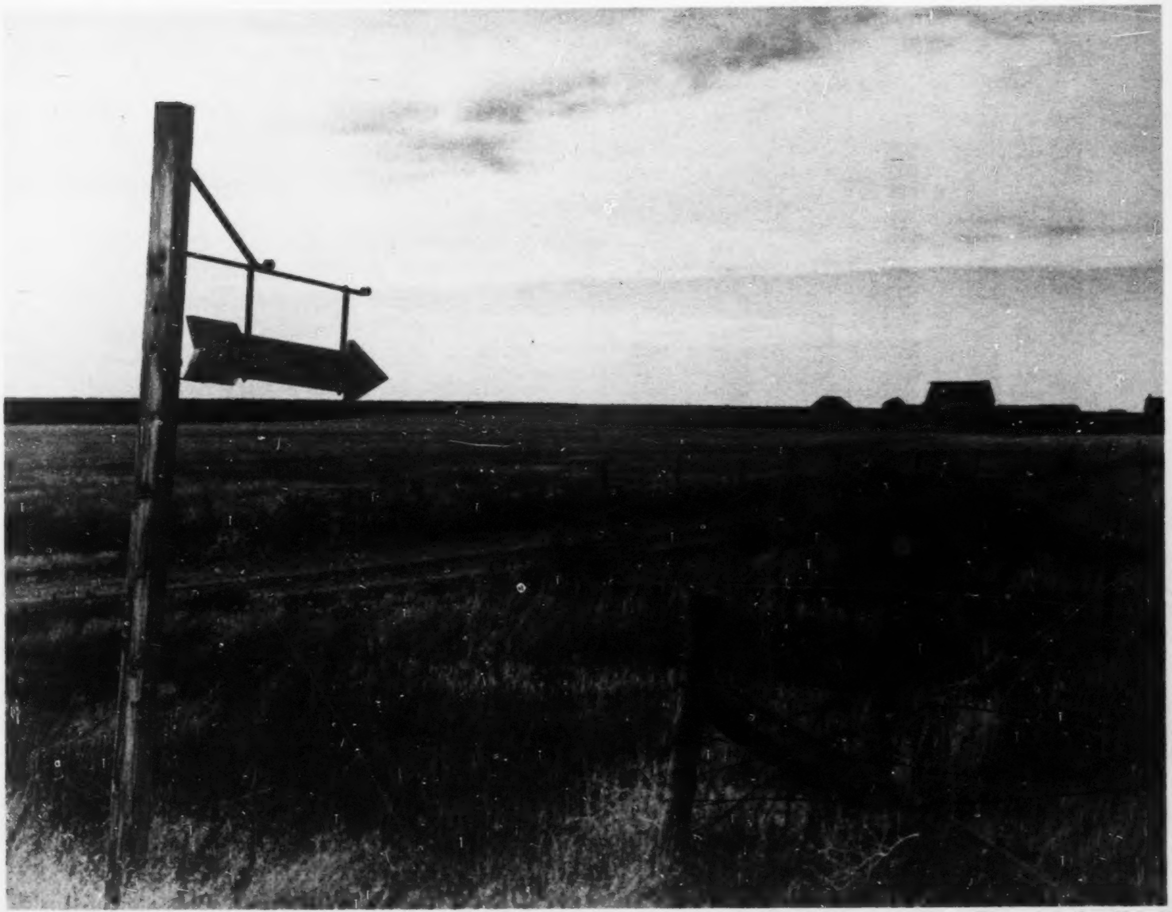

Photo credit: Post Wolcott

A sign along the road points the way to the telephone in Great Falls, MT, September 1941.

Many farmers suffered as a result. Fast growth in rural regions, resulting in part from easy credit extended by Eastern financial institutions, left farmers overextended. Especially in the semi-arid Plains, farm communities experienced hardship due to drought, low commodity prices, high freight costs, and high interest rates.[21] Moreover, in this new commercial environment, farmers soon found themselves competing with one another for the first time. Failure in this competition often entailed a loss of social status, with many farm owners and operators becoming tenant farmers or hired laborers. While the income level of some farming families increased, so too did the income disparities within the agricultural sector as a whole.[22] Under such circumstances, many displaced rural Americans gave up farming and migrated to urban areas. At the same time, the proportion of the workforce employed in the agricultural sector fell from 72 percent in 1820 to 33 percent in 1910.[23]

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[21] Swanson, op. cit., footnote 14. In these sections, the railroads, acting as the agents of development, had offered settlers free rides to available lands and easy credit to those who would settle on farms and along their routes. During a period of post-Civil War prosperity, eastern banks had been eager to loan money using farm land as collateral. With credit available, farmers purchased land, "improvements," animals, and implements. Many new settlers also bought land speculatively as values appreciated. Don F. Hadwiger, "A History of Rural Economic Development and Telecommunications Policy," contractor report prepared for the Office of Technology Assessment, May 1990, p. 11.

[22] Ibid.

[23] U.S. Department of Commerce, Bureau of the Census, *Rural And Rural Farm Population: 1988* (Washington, DC: U.S. Government Printing Office, 1989).

In this changing environment, rural communities became more dependent on outsiders to meet their social and economic needs.[24] Industrialization brought with it new kinds of problems, with which increasingly smaller farm communities could not deal.[25] To meet these developing needs, new towns and trade centers emerged, located at a reasonable traveling distance from farm communities. These centers were, in turn, linked more and more to urban areas. Thus, over time, the self-sufficient rural community became the exception instead of the rule.[26]

The two World Wars, which gave rise to increased mechanization and greater agricultural productivity, exacerbated and finalized these changes. During World War I, manufacturing provided more employment than agriculture for the first time, a situation that became permanent after the Second World War.[27] Rural out-migration also increased because most of the new manufacturing jobs were located in urban areas. At the same time, farms became even more commercialized; between 1950 and 1986, the average farm size more than doubled, while the number of farms declined by 60 percent.

The Current Rural Situation

Most rural economies prospered throughout the 1970s. With a booming national economy, the demand for natural resources was quite high. Rural manufacturing was a special beneficiary of this growth. With labor costs and land values increasing, many manufacturing firms—especially those in low-tech industries producing standardized goods—moved to rural areas where their input costs were lower.[28] As a result, manufacturing grew more rapidly in rural areas than in urban ones, while rural unemployment rates dropped below those in urban areas.[29] Farmers also benefited. With higher prices and high rates of inflation, they could make greater investments in productivity-enhancing technologies. Under these conditions, the total wage and salary from employment in rural areas rose from 19 percent to 22 percent between 1969 and 1984.[30]

This prosperity came to an end at the close of the seventies. A number of factors contributed to this reversal, including the sudden hike in oil prices, the financial squeeze on banks holding Third World loans, the Federal Government's decision to pursue a deflationary monetary policy, the U.S. grain embargo, a glut in the world market for oil and other energy-based resources, and heightened foreign competition, especially from Third World countries.

Although these problems pervaded the national economy as a whole, they had the greatest impact on rural areas. Whereas job growth in urban areas simply slowed down, rural unemployment soared, increasing from 5.7 percent in 1979 to 10.1 percent in 1982. In the early 1980s, the average rural unemployment rate was 7 percent higher than the urban rate; by 1987 it was 40 percent higher.[31]

As in the previous decade, manufacturing is key to explaining how rural economies performed during this period. This sector is significant because 22 percent of all manufacturing occurs in rural areas, and manufacturing accounts for 40 percent of all

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[24] Ensminger, op. cit., footnote 16, pp. 295-296.

[25] As described by Swanson, ". . . Previous social formations, such as the rural church or the one room six grade schoolhouse, gave way to the demands of new industrial employers and regional and national trade. Rural schools were now expected to prepare children for the financial and technical demands of a rapidly industrializing agricultural and nonfarm sector. Local socioeconomic networks such as cooperative harvesting (and risk taking) and quasi-barter exchange systems that mediated local production and consumption under non-commercial conditions were gradually subordinated to and/or eclipsed by new institutions." Swanson, op. cit., footnote 14, p. 22.

[26] Ibid.

[27] In the 1930s, the Depression slowed growth of cities and suburbs and returned people to rural areas. The politics of the Depression, specifically Franklin Roosevelt's New Deal philosophy, brought government money into rural areas, helping to attract and support business.

[28] As Bloomquist notes, "The most notable rural advantage has been the cost of labor . . . Nonmetro areas have comparative advantages over metro areas in other ways as well. Construction of the interstate highway system, for example, substantially reduced transportation costs for many nonmetro places. Land and taxes are also generally cheaper in nonmetro areas. Finally, many nonmetro places made special concessions to firms in the form of tax exemptions, rent-free plant facilities, and so on." Leonard Bloomquist, in USDA, *Rural Economic Development in the 1980's: Prospects for the Future* (Washington, DC: U.S. Department of Agriculture, 1988), p. 52.

[29] It is important to note, however, that the relatively low education level of the workforce attracted more low-tech manufacturing facilities than high-tech ones.

[30] U.S. Department of Agriculture, David L. Brown and Kenneth L. Deavers, "Summary," USDA, op. cit., footnote 28, p. 3.

[31] Edwin Parker, Heather Hudson, Don Dillman, and Andrew D. Roscoe, *Rural America in the Information Age: The Communications Policy for Rural Development* (Lanham, MD: University Press of America, Inc., 1989), pp. 17-19.

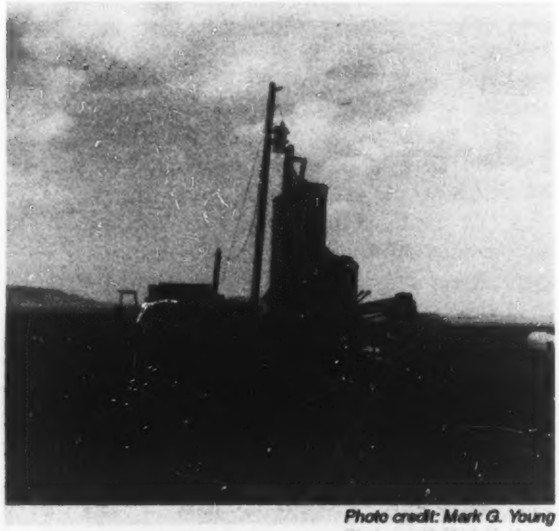

Photo credit: Mark G. Young

A small cement plant in northern New Mexico.

rural employment.[32] Moreover, rural manufacturing takes place in old industries for which there is relatively stagnant demand and severe foreign competition. Unlike the more vigorous complex manufacturing industries that completely recovered from the 1980 recession, these routine manufacturing industries had almost 12 percent fewer jobs after the recession than in 1979.[33]

This decline in employment is probably permanent since many of these jobs have actually disappeared. Over the past two decades, there has been a major structural shift in the economy away from the routine manufacturing jobs typically found in rural areas towards the more highly technological manufacturing and services jobs that are more prevalent in urban areas. This trend will likely continue; even in rural areas service industries now provide more employment than goods-producing industries.[34]

Farm and farm-related workers were also adversely affected by the 1981-82 recession. Farm establishments continued to increase their productivity and size while reducing their need for employment, following the course established during industrialization. Between 1950 and 1986, the number of farms declined from 5.65 million to 2.21 million, while the average farm size increased from 213 acres to 455 acres.[35] The number of agricultural workers also shrunk dramatically, from 10 million in 1950 to 3.7 million in 1980.[36]

Farm communities became much more susceptible to the national economic problems of the 1980s as a result of these developments.[37] Having borrowed and invested heavily during the high-growth period of the sixties and seventies, many farmers found themselves severely overextended when prices and land values dropped sharply. This financial situation was provoked by a decline in agricultural exports due to increased world production and a constrictive monetary policy that lead to high interest rates.[38] Many farmers were forced to liquidate some, or even all, of their farm assets so they could meet their operating and debt-servicing expenses.[39] Agriculture, like manufacturing, did not recover quickly or totally from these circumstances. Between 1981 and 1984, agricultural jobs in most regions declined at a rate of 2 percent per year.[40] With even greater productivity gains and consolida-

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[32] David A. McGranahan, in USDA, op. cit., footnote 28, p. 36. Testifying to the continuing importance of manufacturing in rural areas is the fact that developments in this sector account not only for those communities that did poorly but also for those that did well. However, it was the new manufacturing facilities that did well. See also, Herman Bluestone and Celeste A. Goat, in USDA, op. cit., footnote 28, p. 34.

[33] Ibid., p. 40.

[34] Brown and Deavers, in USDA, op. cit., footnote 28, pp. 5-6. According to the Bureau of Labor Statistics, 90 percent of all new jobs created between 1934 and 1995 are likely to be in services.

[35] Donn Reimund and Mindy Petrulis, ''Performance in the Agricultural Sector,'' USDA, op. cit., footnote 28, p. 81.

[36] Ibid., p. 89. As characterized by Reimund and Petrulis, ''No longer is farming insulated from developments in the rest of the Nation and the world. Farming is a complex business, highly dependent on and linked to supporting input supply industries, food and fiber processors, distributors, retailers, and domestic consumers and international trade.'' Ibid., p. 78.

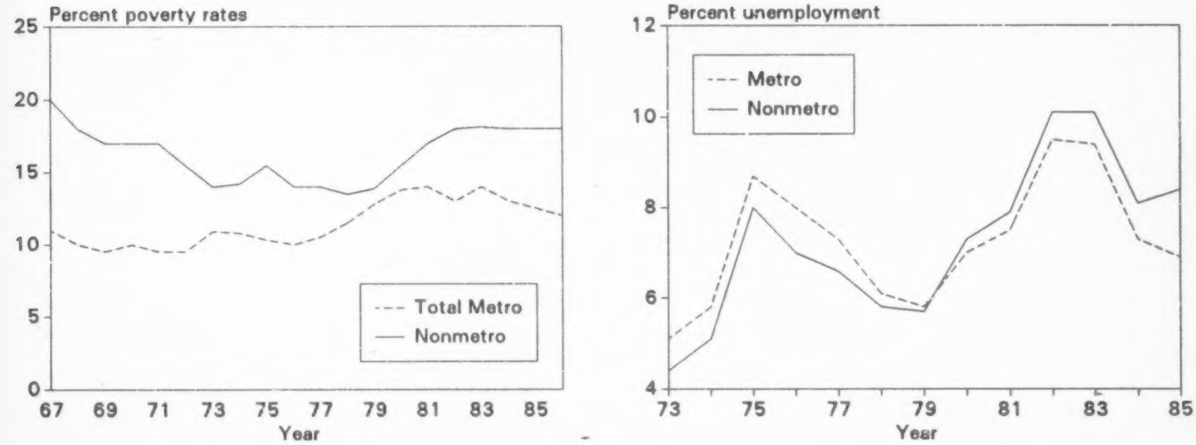
[37] As Reimund and Petrulis stress, the economic problems that farmers faced resulted much more from ''macro policies—tight monetary policy, stimulative fiscal policy, and financial market deregulation—than they were by agricultural incomes or policies.'' Ibid., p. 92.

[38] Ibid., p. 81.

[39] Ibid., p. 89.

[40] As noted, by Reimund and Petrulis, ''Aside from gains in food and fiber wholesale and retail trade of about 157,000 jobs (about 3.3 percent per year), job losses reached almost 107,000 in the farm sector, 45,000 in the input industries, and some 53,000 in the processing and marketing industries. These job losses translate to negative annual growth rates of 1.3 percent in the farm sector, 5.8 percent in the input industries, and 1.5 percent in the processing and marketing industries.'' Ibid., pp. 97-98.

Figure 2-4—Poverty Rates and Unemployment by Residence*



*Metro-nonmetro: 1985 based on the 1980 Census, 1969 and 1971-83 on the 1970 Census, and earlier years on the 1960 Census. No 1984 data.

SOURCE: Bureau of the Census, Current Poulation Survey, as cited in USDA, *Rural Economic Development in the 1980's: Prospects for the Future* (Washington, DC: U.S. Department of Agriculture, 1988), pp. 3, 12.

tions of farm establishments, agriculture will probably never serve again as a basis for economic revival in rural areas.

Nor have the energy-producing and extractive industries been any more successful in coping with the cyclical and structural changes that have taken place. The shift from inflation to a period of tight money was especially difficult for the timber and wood products industries. Inflation initially served to encourage the purchasing of housing. With the pursuit of deflationary policies, however, the real price of mortgages increased, and the housing market collapsed.[41]

Rural areas have few resources to help them overcome these economic problems. Poverty is prevalent, having increased steadily since the late seventies until 1986 when it peaked.[42] The most extensive poverty is in the South where more than half of the nonmetropolitan poor reside.[43] The poverty rate is particularly high among minorities. In fact, blacks living in rural nonmetropolitan areas—especially among the elderly—are far more likely to live in poverty than those living in urban areas.[44] Because the rural poor consist primarily of the working poor, nonmetropolitan poverty tends to be more sensitive to fluctuations in unemployment than urban poverty[45] (see figure 2-4).

These high poverty rates reflect, in part, a lag in nonmetropolitan wages. In 1982, the earnings gap between nonmetropolitan and metropolitan areas

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[41] Bruce A. Weber, Emery N. Castle, and Ann L. Shriver, "Performance of National Resource Industries," USDA, op. cit., footnote 28.

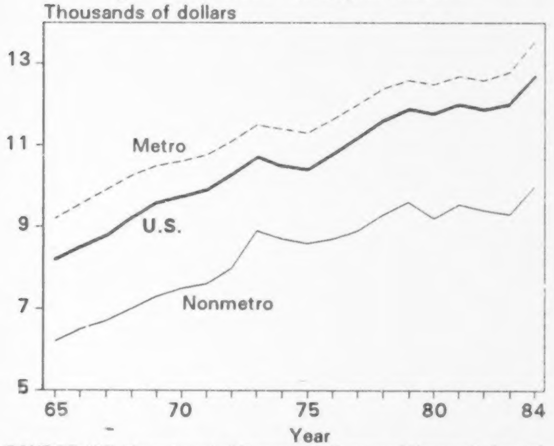
[42] After 1962, nonmetropolitan poverty has been on the decline while metropolitan poverty has held steady. However, the nonmetropolitan poverty rate in 1988 was still 3.8 percentage points above the metropolitan rate in the same year, and 2.3 points higher than the nonmetropolitan rate in 1979, the year in which the last recession began. Robert Hoppe, Economic Research Service, U.S. Department of Agriculture, personal communication, Aug. 21, 1990. See also Kathryn Porter, *Poverty in Rural America: A National Overview* (Washington, DC: Center on Budget and Policy Priorities, September 1988).

[43] Of the 100 nonmetropolitan counties with the highest incidence of poverty in 1980, 81 were located in the South. Per-capita income statistics further suggest that the rural poor tend to be clustered in three Southern regions. Of the 242 nonmetropolitan counties that have experienced persistent poverty, 92 percent are located in Appalachia, the Ozark-Quachita Plateau (which actually includes a portion of Missouri, a state in the North Central region), and the Mississippi Delta. See *Characterization of Poverty in Nonmetropolitan Counties*, Elizabeth S. Morrissey, Rural Development Research Report No. 52, Economic Research Service (Washington, DC: U.S. Department of Agriculture, July 1985); and Thomas F. Hady and Peggy J. Ross, *An Update: The Diverse Social and Economic Structure of Nonmetropolitan America* (Washington, DC: U.S. Department of Agriculture, Economic Research Service, May 1990).

[44] Katheryn H. Porter, *Poverty in Rural America: A National Overview* (Washington, DC: Center on Budget and Policy Priorities, April 1989), pp. 14-15.

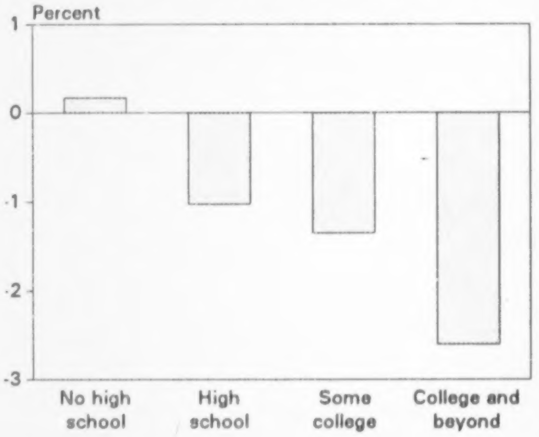
[45] Ibid.

Figure 2-5—Real Per-Capita Income



SOURCE: U.S. Department of Commerce, Bureau of Economic Analysis.

Figure 2-6—Net Nonmetropolitan Migration by Education Level, 1985-86



SOURCE: Bureau of the Census, Current Population Survey, March 1986.

was $5,115 (in 1987 dollars). While wages had increased in both nonmetropolitan and metropolitan areas between 1982 and 1987, they increased less in nonmetropolitan areas, causing the early gap to increase to $5,666 in 1987 (in 1987 dollars).[46] Per-capita income, which takes into account employment, wages, and population size, reflects the same discrepancy. Between 1985 and 1987, nonmetropolitan per-capita income was just over 72 percent of metropolitan income. Per-capita income statistics also suggest that the most rural areas are the worst off. Of those nonmetropolitan counties exhibiting persistent poverty, 6 percent were towns of 2,500 residents or fewer. These counties comprise 35 percent of all nonmetropolitan counties[47] (see figure 2-5).

Levels of educational attainment in rural areas are also lower than in urban areas. In 1980, the median years of education completed by metropolitan residents was 12.6, while the same figure was only 12.3 for nonmetropolitan residents.[48] The high school dropout rate was also higher (16.9 percent in rural areas as compared to 15 percent in urban areas), while the college graduate rate was lower (9.2 percent as compared to 12.8 percent).[49] This gap in educational attainment is exacerbated by the outmigration of better educated people from nonmetropolitan areas. During 1985-86, nonmetropolitan counties experienced a net loss in college-educated residents[50] (see figure 2-6).

Rural school districts also spend less on education than do urban districts. In the 1984-85 school year, for example, urban States outspent rural States by almost $800 per pupil.[51] One reason for this discrepancy is limited resources; as people leave rural areas, the local tax base shrinks, leaving less money to spend on public service for the people remaining. Rural areas may also have less incentive to invest in education, since graduating students are likely to leave home.

As in the case of other socioeconomic indicators, levels of education vary by region. With the exception of several predominantly white counties in the Ozark region of Missouri, a few Native American counties in Arizona and New Mexico, three counties on the North Dakota/South Dakota border, and an Alaskan county, nonmetropolitan areas with the lowest level of education (the bottom 10 percent in average years of education) lie exclusively in the Southern census region.[52] In the South, regions of particularly low educational attainment include the predominantly white Appalachian Mountain region, much of the Mississippi Delta region, counties on the Virginia/North Carolina border, poor black areas of Georgia and Alabama, and Hispanic parts of southwestern Texas.[53]

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[46] Linda Ghelfi, "Nonmetro Areas Lag Metro in Earnings per Job," Sara Mills Mazie (ed.), *Rural Conditions and Trends* (Washington, DC: USDA, Spring 1990), p. 12.

[47] Hady and Ross, op. cit., footnote 43.

[48] USDA, op. cit., footnote 28, p. 20.

[49] Linda L. Swanson and Margaret A. Butler, "Human Resource Base of Rural Economies," USDA, op. cit., footnote 28, p. 165.

[50] Ibid., p. 170.

[51] Norman Reid, "Rural Areas in the 1990s: Prologue to the 21st Century," paper presented at "Risky Futures—Should State Policy Reflect Rural Diversity," the Policy and Planning Center Annual Symposium, Louisville, KY, Dec. 4-5, 1988.

Key Trends Likely To Affect Rural America

How well rural areas cope with their economic problems depends not only on their present situation and resources, but also on future developments and events. There are three major trends that will likely affect rural communities:

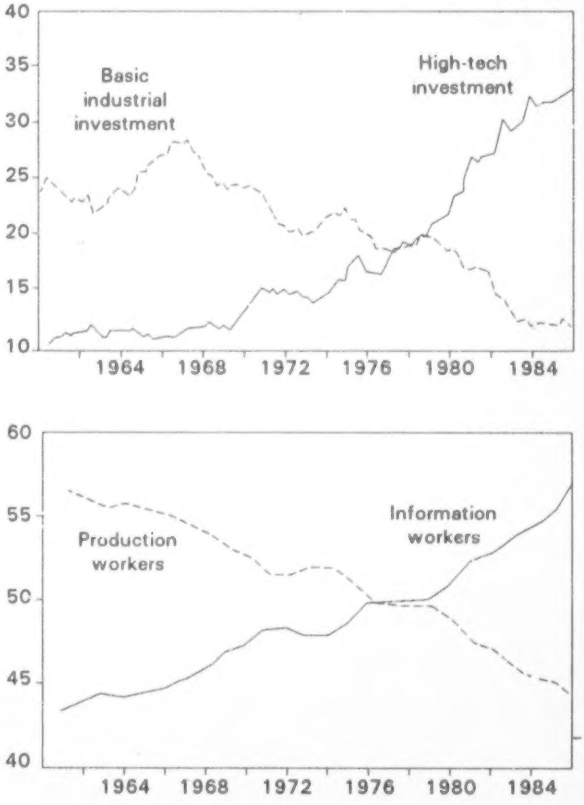
1. the shift to an information-based economy and the enhanced role of communication and information as a strategic weapon in business.
2. the emergence of a global economy and hence the growing need to compete on a worldwide basis.
3. a growing concern about the environment and the environmental costs of economic development.

These trends are eroding the boundaries of rural communities, making these communities more dependent on external events. Together, they define the context in which rural development choices will be made.

The Shift to an Information-Based Economy

The increasing importance of information to the economy is evident from the continued growth of the information sector, a trend that is occurring in all nations. It was to highlight this change that terms such as the "information society" and the "information age" were first employed.[54] The information sector now constitutes about 34 percent of the gross national product, and accounts for approximately 41 percent of the national labor force.[55]

Figure 2-7—Structural Change and the Information Economy



SOURCE: Adapted from *Information Management Review*, vol. 1, No. 1, p. 14, with permission of Aspen Publishers, Inc., Copyright summer 1985.

The changing economic role of information is indicated by the rate and extent to which businesses are deploying and using information technologies (see figure 2-7). Many are now applying computer technology to all of their activities—from recruiting to laying off workers, from ordering raw materials to manufacturing products, from analyzing markets to performing strategic planning, and from inventing new technologies to designing applications and new products and services. These technologies can be used by rural and urban businesses alike to promote efficiency, effectiveness, and innovation.[56]

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[52] Swanson and Butler, op. cit., footnote 49, p. 166.

[53] Ibid.

[54] Pritz Machlup was one of the first to note these changes and to measure the information sector in his pioneering work, now a classic, entitled *The Production and Distribution of Knowledge in the United States* (Princeton, NJ: Princeton University Press, 1962).

[55] Michael Roger Ruben and Mary Taylor Huber, *The Knowledge Industry in the United States: 1960-1980* (Princeton, NJ: Princeton University Press, 1986). This volume updates the work done by Pritz Machlup.

Computer-based communication can improve efficiency in several ways. Technology can be used to improve business operations, by reducing the time it takes to exchange information among persons and machines. In manufacturing, computer links between machines speed up production and assembly. In service firms, such as insurance companies and banks, communication systems increase the efficiency of transaction processing.[57] A well-known example from banking is the reduction of time needed to process letters of credit using computerized files accessible from workstations in several departments. In retailing, the use of machine-readable product codes and automatic scanners in supermarkets increases the efficiency of store operations. Checkout time, inventory control, and accounting operations can be improved by linking the cashiers' stations to the store's computer and automatically recording sales information at checkout.[58]

Faster communication allows businesses to integrate and coordinate widely scattered activities to improve efficiency and effectiveness. In the case of automobile manufacturing, transportation and computer-based communication technologies allow companies to produce components in different regions of the United States and the world, and to assemble them at various locations. Thus, they can reduce costs by taking advantage of favorable conditions in different regions, such as lower wages, cheaper materials, energy savings, liberal financing, etc. In addition, data communication systems allow companies to transfer information instantaneously so they can optimize production schedules, resource allocation, materials management, etc.[59]

Being able to network among disparate locations also gives businesses more flexibility. Management can respond immediately to changes in demand and issue orders to one or more manufacturing plants to reduce or increase output accordingly. Moreover, because programmable machine tools can rapidly be redirected to produce, for example, machine cams instead of gears, computer networks let manufactures tailor highly differentiated products to customer specifications.[60]

PRESQUE ISLE
INFORMATION PROCESSING CENTER

Photo credit: Mark G. Young

The Information Processing Center in Presque Isle, ME, is an example of how rural areas are making the transition into the information economy.

As businesses move to take advantage of these opportunities, the use of information-age technology is likely to be deployed more rapidly and to become more routine. Looking out only as far as 1993, business consultant Peter Keen outlines eight business realities that he expects will be commonplace for all large corporations. These are:

1. Twenty-five to eighty percent of a business' cash flow will be online.
2. Electronic data interexchange will be the norm.
3. Point-of-sale and electronic payments will be one facet of core services.
4. Image technology will be an operational necessity.

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[56] A conceptual framework for identifying the new kinds of business opportunities that information-age technology offers, and a detailed description of how many businesses are taking advantage of them can be found in the OTA study, *Critical Connections: Communication for the Future*, OTA-CIT-407 (Washington, DC: Government Printing Office, January 1990).

[57] Abbe Mowshowitz, "Communication and Comparative Advantage in the Business Arena: Operations and Technology Developments," contractor report prepared for the Office of Technology Assessment, July 1988.

[58] Judith Graham, "Bar Codes Becoming Universal," *Advertising Age*, Apr. 18, 1988, p. 36.

[59] In the service sector, communication technology is more closely associated with the end-product. Brokerage firms buy and sell securities for millions of customers all over the United States and throughout the world. These customers are served by sales personnel in geographically dispersed offices. In banking, the automated-teller machine makes it possible for the retail banks to offer their services in a variety of locations and settings, some of which are not traditionally bank sites at all. For a discussion of the communication needs of financial institutions, see Deborah G. Tumey, "Financial Institution Communication Systems," contractor report prepared for the Office of Technology Assessment, December 1986.

[60] Ibid.

5. Businesses will reorganize and distribute work.
6. Work will be increasingly location-independent.
7. Electronic business partnerships will be standard.
8. The cost of technology failure will be high.[61]

Rural communities cannot stand still in the face of these rapid and fundamental changes in their economic environment. As with any business, they must take advantage of these changes by discovering new ways of becoming competitive, or they will be left behind.

The information age does, in fact, present a number of potential business opportunities for rural America. However, to capitalize on them rural communities must have access to technology and the knowledge of how to take advantage of it.

Previously, the mass-production process limited the kind of activities that rural economies could perform.[62] Rural communities were rarely, if ever, able to operate on a scale large enough to initiate businesses organized around mass-production techniques because of their small size and limited financial and human resources. When rural workers did engage in mass production, it was generally in company branches located and directed from an outside urban center. The key suppliers and markets for such companies were also located far from rural areas. Thus, apart from the direct wages paid to labor, most of the economic benefits escaped the rural economy.

Today, however, given the structural changes mentioned above, these characteristic may no longer disadvantage rural communities. Now, most service-oriented businesses are not operated on a large scale. In fact, approximately one-half of the new jobs created in 1989 were in companies with fewer than 100 employees, and more than one-third were in companies that have fewer than 20 employees.[63] Thus, rural communities' limited size may no longer have a detrimental effect on their ability to compete on an equal basis with urban areas for these businesses and jobs.

Businesses will also be able to operate on a smaller scale using these new technologies. With applications such as electronic data interexchange (EDI), businesses can purchase supplies and produce and distribute products precisely when and where they are needed. Thus, they can avoid the considerable costs (and hence scale required) to procure, store, and distribute a large quantity of goods. In addition, by using technology to identify and target distant consumers, rural businesses will be able to create a demand that is sizable enough to allow them to produce a limited line of goods for niche markets. The number of such markets is estimated to grow in the future, because consumers tastes are increasingly becoming more diversified.[64]

The restructuring and decentralization of business operations could also work in rural America's favor.[65] Depending on the particular case, a firm might decide to manufacture a product at its central headquarters, but transfer elsewhere such downstream activities as distribution, sales, marketing, and service. Rural areas could benefit from this development, to the extent that they can effectively compete for these newly externalized jobs. On the other hand, if conditions are better in other regions or in other countries, rural areas could lose out. This could easily occur because labor costs are often lower in other countries.

The quality of work life could also be improved with information technologies. Many workers will not need to be organized on assembly lines, since new technologies allow businesses to carry out flexible manufacturing organized around craft principles.[66] Information technologies can also upgrade and enhance jobs, when they are deployed together with education and human development programs. However, for this to happen management will need to make a definite commitment. All too often, such a commitment is lacking, and technology ends up deskilling workers. Deskilling is a particular danger in rural areas where skill levels are low to begin with. Local business leaders in rural areas may even oppose human resource development, because the kinds of jobs they want to fill are at or near the minimum-wage level and require an unskilled labor force.[67]

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[61] Peter G.W. Keen, "Business Integration Through Technology Integration," *Advance*, vol. 4, No. 1, pp. 1-2.

[62] As Piore and Sabel have described: ". . . Mass production required large investments in highly specialized equipment and narrowly trained workers. In the language of manufacturing, these resources were 'dedicated'; suited to the manufacture of a particular product—often, in fact, to just one make or model. When the market for that particular product declined, the resources had no place to go. Mass production was therefore profitable only with markets that were large enough to absorb an enormous output of a single, standardized commodity, and stable enough to keep the resources involved in the production of that commodity continuously employed. Michael Piore and Charles Sable, *The Second Industrial Divide: Possibilities for Prosperity* (New York, NY: Basic Books, 1984), p. 49.

[63] Richard P. Adler, "Telecommunications, Information Technology, and Rural Development," paper prepared for Aspen Institute Conference on the Importance of Communications and Information Systems to Rural Development in the United States, July 24-27, 1988 (Menlo Park: CA: Institute for the Future, Paper P-154), p. 10.

[64] Ibid. See also, Don A. Dillman, "The Social Impacts of Information Technologies in Rural North America," *Rural Sociology*, 1985, vol. 50, No. 1, pp. 1-26; and Don A. Dillman and Donald M. Beck, "Information Technologies and Rural Development in the 1990s," *Journal of State Government*, vol. 61, No. 1, January/February 1988, pp. 29-38.

[65] See David R. Vincent, "Building the Information Based Corporation," *Computerworld*, Mar. 12, 1990, pp. 71-72. See also, Ralph Kilmann, "Tomorrow's Company Won't Have Walls," *New York Times*, June 18, 1990, p. 3.

Rural businesses may find it difficult to benefit from new technologies in a number of other respects as well. New technologies provide a competitive advantage precisely because skill and ingenuity are required to apply them effectively. The necessary technical sophistication and understanding is not common in many of the small businesses found in rural communities.[68] Being small, rural businesses may also be unable to get the kinds of discounts and higher quality services large businesses enjoy.[69] The same is true for gaining access to market data and strategic information. Large conglomerates, which are able to aggregate multiple data sets from multiple sources, are better off than small firms. It is also much harder for small companies to get financing for new technologies. This is particularly true in rural areas where access to capital is very scarce. While large manufacturers can absorb the cost of $70,000 for computerized tools, small manufacturers most likely cannot. To a small business, $10,000 is a major investment.[70]

Small rural businesses may also be unable to gain access to new technologies if the public switched communication network in their areas is inadequate and they lack the resources required to deploy and manage their own communication system. One D3 circuit, for example, which provides a transmission pipeline operating at the rate of 45 megabits per second, costs approximately $1 million per year. Thus, the costs for a business to operate a large-scale telecommunication system on its own can be prohibitive.[71]

The Decline of the U.S. Competitive Position and the Emergence of a Global Economy

The technological and economic foundations that once gave the United States a dominant position in the world economy have been slowly and subtly changing for at least three decades. But it was not until the early eighties—when the balance of U.S. trade began to worsen dramatically—that the end of U.S. hegemony became starkly apparent.[72] Much of the increased trade competition is in the area of primary goods and low-tech industries. Rural areas could easily suffer because these are the industries in which they have traditionally specialized. On the other hand, increased foreign investment in the United States and worldwide growth in trade might provide new economic opportunities for rural communities.

One continuing trend has been the shift away from the importance of agriculture, a development that is no longer limited to industrialized countries. While

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[66] Piore and Sabel, op. cit., footnote 62.

[67] A study of Southern States found, for example, that those nonmetropolitan counties that had a high, or growing, proportion of their labor force in the service sector were associated with higher levels of unemployment and lower levels of median family income. Louis E. Swanson, op. cit., footnote 14.

[68] As Don Dillman has pointed out: "Traditionally rural people and places are slower to adopt new technologies than are urben people. Survey data from Washington state suggest that this lag continues in the case of information technologies . . . For many people, learning to utilize information technologies will involve dramatic and perhaps traumatic change." Don A. Dillman, "Testimony Before Subcommittee on Rural Economy and Family Farming," Committee on Small Business, U.S. Senate, July 13, 1988.

[69] As the Chief Executive Officer of one network management company noted: ". . . Here is where large companies and their fat contracts have two key advantages over a smaller user. Small companies are often stuck with buying vendor vanilla. Nothing can set them apart from the competition. Strategically, large companies, however, can do some tailoring, which can give them an edge. This is a distinct reversal of the concept that says smaller companies can be more innovative than big companies." Margie Semilof, "Communication Gap," *CommunicationsWeek*, June 13, 1988, p. C9.

[70] Manfred Kochen, "Advanced Information Technology and Small Manufacturers," *Science*, April/May 1986, p. 26.

[71] It has been estimated, for example, that the annual expenditures of the top 100 communication users range from between $1 billion at the top of the list to about $20 million at the bottom, with the average expenditures falling between $50 million and $100 million. See Jim Foley, "Our First Look at the Top 100 Communication Users," *CommunicationsWeek*, Closeup, May 1, 1989, p. C3.

[72] The increase in imports resulted in part from a 75-perent increase in the value of the U.S. dollar. This sizable revaluation of the dollar created an enormous incentive for U.S. consumers to purchase foreign goods, and a disincentive for foreigners to buy U.S. products.

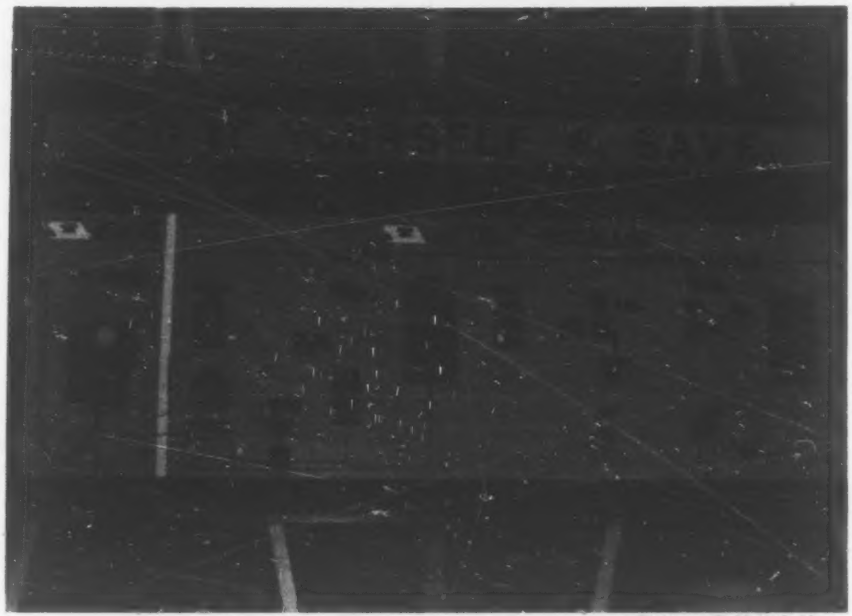

Photo credit: Mark G. Young

The customers of the South Central Rural Telephone Cooperative in Glasgow, KY, are greeted with this instructive sign on how to connect their own telephones.

agricultural output has increased in absolute terms, its share of total output continues to decline worldwide. In developed countries, the share of agriculture in gross domestic product fell from 5.5 percent in 1965 to less than half of that by 1986. Dramatic shifts in the importance of agriculture have also taken place in the developing countries, particularly those in Asia. Between 1965 and 1986, for example, the agricultural share of all developing countries taken together fell from 28.4 to 15 percent. The share of the developing countries in Asia dropped from 38.0 to 17.8 percent.

The decline in agriculture has freed up resources for other kinds of economic activity. In developing countries, there has been a shift to all other sectors.[73] Of particular concern for rural areas has been the outstanding rate of growth in manufacturing activities achieved by the developing economies of the Pacific, such as the Republic of Korea, Hong Kong, and Malaysia. Here, growth in manufacturing output averaged over 10 percent between 1965 and 1986. This shift has been accompanied, moreover, by an improvement in their trade positions. By 1987, all of the developing countries, collectively, accumulated a positive trade balance totaling over $53 billion. Rural areas in the United States, the developing countries' major competitors, appear to be the losers.

Other evidence supports this conclusion. According to the United States Department of Agriculture, rural areas in the United States lost 11,000 jobs between 1975 and 1982 due to imports. All in all, 201 rural counties experienced severe unemployment, having lost more than 10 percent of their manufacturing jobs. Some industries, and hence some regions, were more sensitive to imports than others. The sharpest decline was in the textile and apparel industries. These labor intensive, low-wage industries use simple production processes and require only modest labor skills so they are especially vulnerable to competition from less developed countries. In contrast to rural areas, unemployment in urban areas did not increase due to imports.[74]

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[73] Between 1965 to 1986, for example, the share of output originating in the industrial, construction, and service sectors increased, respectively and in percentage terms from 23.3 to 30.6; from 16.9 to 20.7; and from 42.8 to 48.7. Larry Darby, contractor report prepared for the Office of Technology Assessment, Spring 1990.

Box 2-A—Forces Underlying The Global Economy

- The growing similarity of countries, with respect to tastes as well as to infrastructure, distribution channels, and marketing approaches.
- The emergence of a global capital market as witnessed by large flows of funds between countries.
- Declining tariff barriers and the establishment of regional trading agreements.
- Shifting opportunities for competitive advantage due to technology restructuring.
- The integrating role of advanced information and communication technologies.
- Slow and uneven world economic growth that has fanned the flames of international competitiveness.
- The emergence of new global competitors, principally from East Asia.

SOURCE: Michael E. Porter (ed.), *Competition in Global Industries* (Boston, MA: Harvard Business School Press, 1986), p. 405.

Box 2-B—New Forms of Global Competition

The operation of this new international division of labor can best be illustrated by the processes used (initially) by Japanese consumer electronics firms. The first stage of production, involving the conception, research and development of new products, requires highly trained and specialized technical personnel of the type residing in Japan. This labor-intensive, initial stage is carried out domestically. The second stage is more capital intensive, but requires highly skilled and specialized labor to produce very sophisticated and highly technical electronic components. This phase is typically carried out in flexible, special-purpose plants at home. The third and final stage is again labor intensive, but requires a different kind of labor from that utilized in the first two stages. It is basically an assembly process, designed to be simple, and requiring a disciplined, but not exceptionally skillful labor force.

SOURCE: For further discussion see, Nigel Grimwade, *International Trade* (London: Routledge, 1989).

This heightened competition is reinforced by the emergence of a global economy (see box 2-A). Patterns of international trade now primarily reflect patterns of international production. And specialization takes place on the basis of parts and special components, rather than on the exchange of finished products. Today, for example, Japan provides approximately 40 percent of U.S. component parts in electronics and automobiles.[75]

In this global economy, the multinational corporation is becoming the norm. And, whereas in the past multinational corporations tried to exploit comparative advantage by producing or selling in a single country, today they seek more the advantage to be gained by integrating all their activities on a worldwide basis[76] (see box 2-B). In such an environment, production, just like capital, can be moved from place to place throughout the world.

If rural communities are to survive, they too must be globally oriented. The global economy could harm rural economies, if rural businesses (or businesses that might otherwise have located in rural areas) export jobs and capital to other parts of the world. On the other hand, if they create the right conditions—such as an educated workforce—rural communities might attract foreign businesses and capital to their communities. With access to a much larger and more diverse market, rural communities will also be able to produce on a small scale for niche markets (see box 2-C). To identify new markets and to sell worldwide, rural communities must have upgraded communication infrastructures.

A Growing Concern About the Environment, and the Environmental Tradeoffs in Economic Development

Environmental concerns about the potentially negative impacts of growth can be traced back to the early sixties. Since that time, the public has become

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[74] However, both the sectoral composition and regional location changed, with "low-tech" industries in the Northeast and Midwest losing employment, while "high-tech" industries in the South and West (and Vermont) offset those losses with increased employment. Metropolitan areas in California, Texas, and Florida gained over three-quarters of the new jobs. Ibid.

[75] As Jack Behrman has pointed out, specialization has also taken place ". . . based on different product characteristics; mass consumption versus high fashion, or low quality versus high quality, or generic versus trademarked goods." Jack N. Behrman, *Industrial Policies: International Restructuring and Transnationals* (Lexington, MA: Lexington Books, 1984), p. 72.

[76] Michael E. Porter (ed.), *Competition in Global Industries* (Boston, MA: Harvard Business School Press, 1986), p. 405.

Box 2-C—Maine's Sea Urchin Industry

Sea urchin roe is a prized delicacy in Japan served on special occasions and holidays, and is found all over the world—Chile, Alaska, California, North Korea, South Korea, and the Soviet Union. Until recently the sea urchin off the coast of Maine was regarded by lobstermen as a pest that scavanged the bait from lobster pots. Within the last few years, though, sea urchin has been discovered as a valuable resource, and a new industry has been born in Maine. Now merchants, lobstermen, and divers along the coast are claiming a portion of an industry that has become estimated at $100 million internationally.[1]

As few as 6 years ago, there were only two divers harvesting sea urchins in the State, according to Lloyd Covens, one of those two pioneers. Six years later, after Mr. Covens convinced a few Japanese merchants to take a risk on Maine's product,[2] Maine has become an important source of uni, as the sea urchin's roe is called in Japan. Last year, 74 merchants harvested an estimated 8.7 million pounds, worth about $3.5 million.[3] This year, about 10 million pounds of sea urchin will be harvested, of which about half will be by Lloyd Covens' Portland-based company, Urchin Merchant. Urchin Merchant, which employs about 300 divers and fishermen, is the largest such firm in the area, with an estimated payroll of $3 million.[4]

The rise of this industry is greatly facilitated by transportation and communications. Virtually all of it is shipped to Japan (the roe that is consumed in Japanese restaurants in America comes from California), and because the urchin's roe must be delivered while it is still alive, it requires fast and reliable communication and transportation. In addition, the market for uni is very volatile, fluctuating greatly in such events as the death of a statesman or a natural disaster. Merchants, therefore, must be in constant contact with their customers in Japan.

In order to keep Urchin Merchant competitive in the international market and ahead of his regional rivals, Mr. Covens keeps a computer database on each of the reefs off the Atlantic coast from Gloucester, MA, up into Canada. He explains that each reef's family of urchin is be ready for harvesting at different times. By keeping this information on a computer, he is able to direct his fishermen and divers to the optimal locations for harvesting, and thus ensure the highest quality of product for his customers.

A second factor which gives Covens an edge is that he uses his computer to gather weather data in order to track and predict the weather, which plays an important part in the harvesting of urchin. Success depends on the ability to accurately anticipate the amount and the timeframe for delivering the product. The roe must be delivered to Japan still alive and thus cannot be stored. (The roe is sent to be processed in Japan within hours after being removed from the ocean. After being processed, it will remain fresh for as long as a week.[5]) His ability to compute and analyze weather patterns gives him a distinct advantage over his smaller counterparts who do not have such capabilities.

The affect of this new source of commerce is a tremendous boon to Maine. Many lobster fishermen are out of work once the demand for lobster wanes during the winter months. Many collect unemployment compensation or are forced to take up other menial jobs in fisheries, according to Covens. The rise of the sea urchin industry, though, provides a well-paying alternative for the lobstermen in the area in which they are skilled—operating their boats and navigating the ocean. Maine's sea urchin season, which runs from October to April, compliments Japan's season, which generally lasts through the summer months.

The harvesting of the sea urchin also requires high-skilled divers who pick the urchins off reefs along the coast. Divers generally earn between $600 to $1,200 a week, and up to as much as $2,500.[6] Covens estimates that the industry supports as many as 1,000 divers. Marine supply stores and dive shops, which in the past closed down during the winter, also benefit from the robust and growing trade. Covens points out that whatever measure this industry has on the trade deficit—even if it is humble—is not nearly as important as the psychological effect of being able to employ hundreds of Maine residents in well-paying jobs.

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[1] Dena Kleiman, "Scorned at Home, Maine Sea Urchin Is a Star in Japan," *New York Times*, Oct. 3, 1990, p. C1.

[2] Personal correspondence with Lloyd Clovens, Jan. 3, 1991.

[3] John Laidler, "For Maine's Urchin Industry, a Sometimes Prickly Roe to Hoe," *The Washington Post*, Jan. 4, 1990, p. A3.

[4] Personal correspondence with Lloyd Clovens, Jan. 3, 1991.

[5] Dena Kleiman, "Scorned at Home, Maine Sea Urchin Is a Star in Japan," *New York Times*, Oct. 3, 1990, p. C1.

[6] Ibid.

Photo credit: Mark G. Young

The small lumber mill in Cle Elum is a testament to the continued importance of forestry to Washington State's rural communities.

more sensitized to the environment, often providing strong support for environmental protection. Thus, today, environmental impact statements (EIS) are commonplace. Environmental issues will loom even larger in the future, because, as a society, we are becoming more dependent on technological solutions.

Rural areas find it particularly difficult to make choices regarding growth and the environment. Many rural economies are totally dependent on activities that have major environmental consequences, so environmental protection can cost them jobs. The protection of public lands has limited logging and mining; concerns about groundwater contamination, soil erosion, and food safety have constrained farm practices; and efforts to control emissions and waste disposal have restricted rural manufacturing (see box 2-D).

Because rural areas face so many problems, they find it difficult to attract newer industries that have fewer environmental impacts. Some communities have been able to take advantage of their scenic beauty to develop recreation areas and retirement communities. All too often, however, they are the communities of last resort—at worst, a place to dump urban waste.[77] With high unemployment rates due to a depressed uranium industry, the town of Grants, New Mexico, for example, believes its best prospect for providing jobs is to become the prime location for privately owned prisons.[78]

Communication and information technologies can provide rural communities a means to develop or attract rural businesses that are neither harmful to their environment nor to their local ways of life. Using these technologies to identify distant buyers and negotiate optimal prices, some rural communities have developed niche markets, based on their own local resources. Ganados del Valle, for example, is a weavers' cooperative operating out of Los Ojos, New Mexico. For years, seasonal unemployment rates were so high that many State officials were ready to "write it off." Inspired and energized by Maria Varela, a woman seeking to help develop the area, members of the community set up a successful sheep herding and weaving cooperative. Their goal was to build an economic base using the community's own natural resources. Pooling their flocks, the townspeople held phone auctions and sold their sheep at a top price. The women in the community produced garments in keeping with traditional Rio Grande weaving techniques.[79]

Rural citizens often feel that outsiders are forcing them to make choices about development and the environment. Many times local sentiment favors development, while the State government, Federal Government, or the national environmental community seek to limit it (see box 2-E). Residents of northern Maine, for example, are eager to mine a rich copper lode in Ball Mountain, and resent that the State's Department of Environmental Protection is standing in their way. Some States are trying to reduce the job impact of environmental protection by supporting retraining and the diversification of rural economies (see box 2-F). One fruitful approach might be to link these programs to the deployment of information and communication technologies to rural areas.

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[77] Commenting on how to create safe nuclear facilities, Massachusetts gubernatorial candidate John Silber, suggested, for example, "Maine is a good location for a nuclear powerplant—where the damn thing could have an accident and not hurt anybody." As cited in *Newsweek*, Aug. 13, 1990, p. 15.

[78] New Mexico is attractive to prison entrepreneurs because much of it is unzoned. Many private, correctional outfits have sought to locate there. "As Prisons Go Private The Neighbors Go to Court," *Business Week*, June 11, 1990, p. 28.

[79] Jon Christensen, "A Different Kind of Bean Field," *High Country News*, Oct. 24, 1988, p. 24. Ms. Varela was recognized for her work helping the communities of rural New Mexico as one of the 36 recipients of the annual John D. and Catherine T. MacArthur Foundation awards. Kathleen Teltsch, "MacArthur Grants Are Awarded to 36," *New York Times*, July 17, 1990, p. A18.

Box 2-D—Lake Cumberland, Kentucky

The proposed expansion of Union Underwear in Jamestown, KY, has sparked a controversy pitting environmentalists and recreationalists against local developers and residents who depend on the company's $45 million annual payroll. The company proposes to construct a pipeline to divert treated wastewater—used in the process of dying fabric—from Lily Creek directly into Lake Cumberland. Although the project potentially poses environmental harm, the town of Jamestown and the State find themselves in a bind. If opposition becomes too great, Union has stated its intention to move part or all of its operation to North Carolina.

For its part, Union Underwear sees the pipeline as a solution to environmental concerns: rather than emptying the wastewater into the smaller, but more convenient Lily Creek, the company would construct a pipeline that would carry the wastewater into the larger body of water, Lake Cumberland, where the concentration of chloride—the salt used to bind color to the fabric used for Union's undergarments—would be 250 parts per million, well below the standards established to protect the Lake's aquatic life.

Conservationists and local fishers fear that despite the regulatory guidelines to limit the concentrations of salt, copper, lead, arsenic, and other metals in Lake Cumberland, the government can actually do very little to protect the environment once Union starts emptying the effluent. Environmentalists raise the issue of the cumulative effects of the effluent from Union Underwear, as well as the wastewater that reaches Lake Cumberland from Jamestown and 30 other municipalities. They contend that over time, Lake Cumberland will face the same consequences as did the Great Lakes when they became industrial dumping grounds.

Union Underwear, its workers, and many in the community of Jamestown who depend on Union either directly or indirectly for their livelihoods, view the arguments of the environmentalists—who come mostly from outside the community to enjoy the natural beauty and recreational opportunities at the Lake—with suspicion and some resentment. They contend that Union's presence is critical to the economic survival of Jamestown.

SOURCE: Bob Hill, "The Cumberland Flap," *The Courier Journal Magazine*, May 13, 1990, p. 4.

Box 2-E—Development v. the Environment

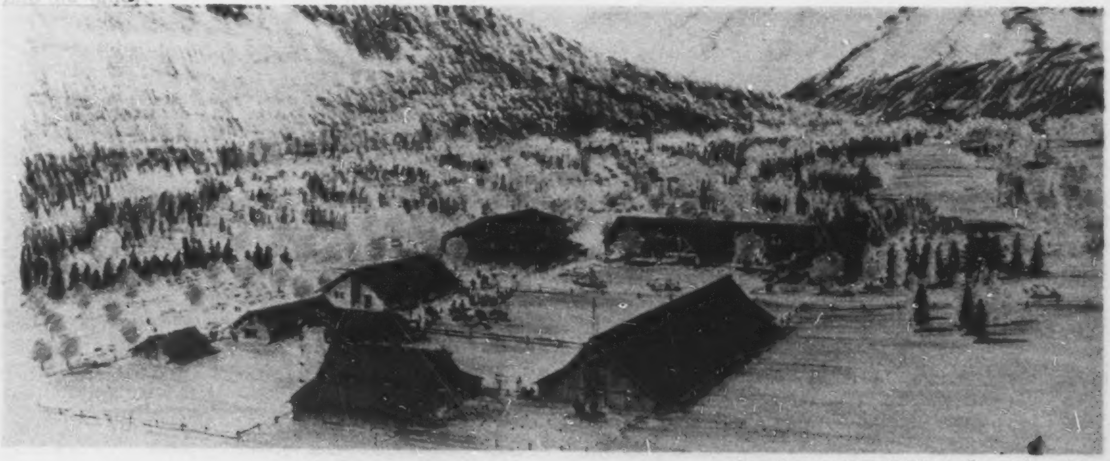
Many rural communities increasingly depend on tourism to produce much-needed local income. As the environmental movement gains momentum and legitimacy, however, conflicts over how such development will effect an area's environment—its resources, its people, and its history—are a growing impediment to such development.

The conflict over the environment versus the economy is particularly complicated in Washington, where the battle lines are already clearly, and often fiercely, drawn with regard to the issue of logging the State's rich forests. As another manifestation of this conflict, the development of the Early Winters Resort in the Methow Valley, on the other side of the Cascade Mountains from Seattle, has aroused considerable friction in the State for the past several years. The contested development includes plans for a four season destination resort facility complete with a ski mountain, ranches, residences, golf courses, and a village. It typifies the tension between developers along with those for whom development promises jobs, on the one hand, and environmentalists and those who caution that development threatens to scar the area's scenic splendor and rural quality and to interfere with traditional ways of life, on the other.

Tourist-based local development brings in new jobs and stimulates the local economy: Early Winters estimates that upon completion, the resort will generate 1,200 jobs in Okanogan County and add $80 million a year to the local economy and $100 million a year to the State's economy. Before the project is even complete, the resort will produce 200 to 300 full-time construction jobs a year, with a construction payroll of $11 million.

Because tourist-based development depends on the beauty and recreational offerings of the region, it is in the interest of the developer to preserve the original character or charm. However, developers have often largely disregarded the ecological problems associated with development. Wary of the changes that development might bring and cautious about the environmental impacts of developing the Methow valley, citizen groups such as the Methow Valley Citizen's Council and the Friends of the Methow Valley have held up the project with administrative proceedings. These groups contend that the development could harm the mule deer population, which is the largest in Washington State. Project opponents also fear that instream waterflows could be damaged by snowmaking activities, sewage treatment, and increased domestic water uses.

Rather than dismissing the environmentalists concerns, the Early Winter's development has undertaken extensive studies of the Valley's environment and investigated ways for the development to exist as part of the local beauty instead of exploiting the natural surroundings. For example, mule deer migration corridors and habitat areas will be designed into the baseland resort. Water systems will be designed to store the spring run-off from winter snows for irrigation and snowmaking purposes later in the year. Water used for sewage and indoor domestic uses will be treated and returned to the aquifer. In addition, construction plans have been designed so the trees and natural landscape will screen most buildings, roads, signs and other structures from view along Highway 20, which leads into the Valley.



Compliments of: Early Winters Resort Associates

Artist's rendition of Wilson Ranch, a part of the proposed plan.

Box 2-F—Retraining Miners in Appalachia

The Business and Industry Technical Assistance Center (BITAC) was formed as part of Kentucky's Hazard Community College in 1986 to redress high unemployment in the eight-county region due to the loss of jobs in the coal industry. The Center's main mission is to teach displaced miners and disadvantaged workers the entrepreneurial skills to start their own businesses, according to its director, Charley Simpson.

> Hazard is located in the heart of the Appalachian coal fields. Yet coal jobs, the mainstay of economic survival for generations of Eastern Kentuckians, have declined over 25 percent in 10 years. Real unemployment in some counties approaches 50 percent.[1]

BITAC was conceived of by Hazard Community College's President, Dr. G. Edward Hughes, who has made economic development a priority of the college, along with Professor Richard Crowe, whose Small Business Information Center was BITAC's predecessor. According to Dr. Hughes, "BITAC is an aggressive, active economic and community development arm of the College."[2] Its instructors—experienced local businessmen—help others find niches that are not being served in the community or that are only being served at great distances and start up and operate businesses to fill that demand in order to keep the dollars in the community.

The Center's success is well known. With a staff of 6, including the director, a business liaison, and 2 entrepreneurial instructors, the Center has helped to launch nearly 200 businesses since it was founded in 1986. It has won several awards in recognition of its positive impact on economic development in Appalachian Kentucky, including the American Association of Community and Junior Colleges' "Putting America Back to Work Award." BITAC has been singled out by the National Association of Counties and by the U.S. Department of Commerce's Economic Development Admininstration. The State legislature is considering creating similar programs in the other 14 community colleges and 6 regional State universities.

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[1] "No Mission Is Impossible" *Community, Technical, and Junior College Journal*, vol. 60, No. 4, February/March 1990.

[2] Ibid.

SOURCES: Fran Jeffries, "Heralded Hazard Training Program Launches Mountain of Entrepreneurs," *The Courier Journal*, Louisville, KY, Mar. 19, 1990. Steve Baron, "Through BITAC, College Creating Business, Jobs," *Communi-K*, the University of Kentucky's Faculty-Staff Newspaper, vol. 22, No. 11, Nov. 13, 1989. "No Mission Is Impossible" *Community, Technical, and Junior College Journal*, vol. 60, No. 4, February/March 1990. Personal correspondence, Charley Simpson, BITAC Coordinator, Jan. 8, 1991.

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Chapter 3

Rural America and the Changing Communication Infrastructure

Findings

If rural areas are not to experience further decline, measures will need to be taken to assure that they have access to the necessary infrastructure. The previous means and methods of providing access are no longer viable. New ways need to be developed for delivering communication services to rural areas. With divestiture and greater competition in the communication industry, urban models are no longer valid in rural areas. What are required are Rural Area Networks (RANs) that allow rural communities to devise new and creative ways of achieving economies of scale and scope. Just as businesses are taking advantage of advances in technology and the unbundling of the network to develop local area networks, wide area networks, and metropolitan area networks, rural areas will need to develop networks that are customized to their own needs. To do so, they will need a far greater understanding of the possibilities that new technologies afford, and of how these technologies can be used cooperatively by all rural citizens, allowing them to share in the benefits of the information age.

Introduction

The communication infrastructure that supports the flow of communication in society is a critical part of the social structure. Its makeup and the rules that govern its use greatly affect all social interaction.[1] The technical features of the infrastructure, for example, determine the types of messages that can be exchanged, the ease and speed of their delivery, and their accuracy. Similarly, the infrastructure's architecture—the way that facilities are arranged, distributed, and interconnected—determines who is able to communicate, under what conditions, and how effectively.

Rural areas characteristically have low population densities and are generally distant from urban areas. For them, one of the most critical aspects of the communication infrastructure is that related to the costs associated with providing services to few people over large areas. Thus, access in rural areas is likely to be affected most if technological advances or regulatory decisions alter the distant-sensitive costs of providing these services. Because of this, innovative ways must be sought to share resources and costs.

How rural communication systems are designed and the technologies that comprise them will also affect rural areas. Communication technologies are not equal. They give rise to different impacts. Some communication technologies and network architectures tend to reinforce community ties, whereas others serve to undermine them.[2]

Rural communities must also maintain the quality of their communication infrastructure (its capacity, reliability, interoperability) vis-à-vis communication networks in urban areas. If modernization in rural areas lags behind that in urban areas and other countries, rural residents may be unable to link to other critical communication facilities, such as private business networks. In order to interconnect efficiently, communication networks must be comparable.

The form that the communication infrastructure takes will be determined by decisions made in the marketplace and by government. These decisions are greatly influenced by technological advances.

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[1] The communication infrastructure is both nested in and sustains the larger social system of which it is a part. For communication is the basis for all human interaction and one of the means for establishing and organizing society. Communication is the process by which all social activity is conducted; without it a society could not survive. It is the means by which group norms are established, expectations are voiced, individual roles are assigned, change is enacted, social control is maintained, and activities are coordinated.

Communication also allows the individual to function in society. Only through interaction with others do individuals acquire the tools of language and the shared sense of reality they need to establish intimate relations and to cooperate to achieve common goals. Through acts of communication, people define themselves—their sense of uniqueness as well as their self concepts—and negotiate and sustain a position and place for themselves in the world. See for discussions, Martin Lawrence LeFleur, *Theories of Communication* (New York, NY: David McKay Co. Inc., 1970); Lucian W. Pye (ed.), *Communication and Political Development* (Princeton, NJ: Princeton University Press, 1976); and Dudley D. Cahn, Jr., *Communication in Interpersonal Relations* (Albany, NY: State University of New York Press, 1985).

[2] Richard Kielbowicz, "The Role of Communication in Building Communities and Markets," contractor report prepared for the Office of Technology Assessment, November 1987.

All of these developments are, together, reconfiguring the Nation's communication infrastructure in ways that present both problems and opportunities for rural America. To formulate policies that allow rural communities to benefit from information-age technologies, decisionmakers must understand how the changing infrastructure may affect rural areas.

The Impact of Communication Technologies on Rural Areas in the Past

Communications technologies change relationships of time and space. This is particularly important to remote, sparsely populated rural areas. One way of assessing the potential impacts of communications on economic development in rural areas is to examine how the emergence of new communication technologies affected it in the past. The impacts of communication technologies on rural areas have not necessarily been favorable.[3]

The transformation of the rural American landscape at the turn of the century was facilitated, if not actually promoted, by improvements in transportation and communications.[4] Advances in these technologies were particularly important in the development of a national market.[5] Improvements in intrafirm communication, through the use of telephones and telegraphs, allowed businesses to expand their spheres of operation and centralize decisionmaking in distant headquarters.[6] Firms grew larger and extended their reach; distance no longer insulated local firms from competition with out-of-

Photo credit: Russell Lee

Street car employee in Oklahoma City, OK, reports over the telephone, 1939.

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[3] For what may be considered the classic discussion of how communication technologies can disadvantage local, vis-à-vis metropolitan, areas, see Harold Innis, *The Bias of Communication*, 1951 (Toronto: University of Toronto Press, reprint, 1971). According to Innis, communication technologies that served to overcome the barrier of distance and time tended in the long run to make rural areas overly dependent on urban centers. As James Carey notes with reference to Innis' work, "Innis attempted to show how localities and regions resisted the spread of communication, how the relationship was decided by a protracted series of conflicts over the spread of standard time, the mail order house, parcel post and rural free delivery, the department store and the regionalized corporation." James W. Carey, "Space, Time, and Communications: A Tribute to Harold Innis," James W. Carey (ed.), *Communication as Culture: Essays on Media and Society* (Boston, MA: Unwin Hyman, 1989), p. 143.

[4] As described by James Carey, the development and deployment of new transportation and communication technologies gave rise to "a continual process of decentralization and recentralization that moved forward in a dialectical way as small hinterland communities attempted to outrun metropolitan influence, only later to be absorbed back into it." James Carey, ibid.

[5] The development is clearly illustrated by a convergence of prices across the Nation. As Richard DuBoff notes with respect to the cotton market, "Data on cotton prices in New York show diminishing fluctuations over time. The average spread between lowest and highest prices narrowed steadily, except during the Civil War and its aftermath, and the steepest declines in high-low price ranges and dispersion of prices from decade averages came in the 1850s—'the telegraph decade,' as it might well be called." Richard B. DuBoff, "The Telegraph and the Structure of Markets in the United States, 1845-1890," *Research in Economic History*, vol. 8, 1983, p. 257.

[6] As both Alfred Chandler and James Beniger have pointed out, specialization can only take place, and productivity can only be increased, to the extent that goods can be moved, processed, and distributed and that the production process itself can be coordinated. It was only with the development of the railroads in the 1830s and the telegraph in 1844 that the requisite speed and control in the process of production and exchange could be achieved. By increasing the speed of communication and extending the range of possible control, the railroad, the telegraph, and later the telephone facilitated the growth of large-scale organization with modern management structures, a first step in the centralization of production and distribution. See, for discussions, Alfred D. Chandler, Jr., *The Visible Hand: The Managerial Revolution in American Business* (Cambridge, MA: Harvard University Press, 1977); and James R. Beniger, *The Control Revolution* (Cambridge, MA: Harvard University Press, 1986).

town businesses. Although competition was greater, increasingly it took place among larger and larger firms located primarily in urban rather than rural areas.[7]

The advent of the mass media also encouraged the development of a national marketplace. The trend toward national distribution of printed matter culminated with the emergence of inexpensive popular magazines such as *The Saturday Evening Post*, *The Ladies Home Journal*, and *Country Gentleman*. The mails, of course, were crucial in the delivery of these publications, and the inauguration of Rural Free Delivery in the 1890s enabled magazines to flow from publisher to country lanes.[8]

However, the impact of the mass media on rural economies was also problematic. The explosive growth of popular magazines intensified competition for advertising among segments of the publishing industry, and the winners in this competition reflected shifts in the Nation's marketing system.[9] The small, local retailers, which had once served their communities with little competition, suddenly faced a succession of new challengers—department stores, mail-order firms, and chain stores. The metropolitan press increasingly tied its fortunes to department stores and chains; and magazines were well positioned to run advertisements for nationally marketed consumer goods that were sold through all kinds of outlets.

Notwithstanding the problems associated with the deployment of communication technologies, rural areas could not have afforded to forgo them, for the shifts in the national economy were not accidental. They were closely associated with the development of regional and national infrastructures, and a rural area's proximity to these trade networks proved to be a critical factor in determining its ability to survive.[10]

The deployment of some communication technologies also served to undermine the cohesiveness of rural communities, weakening their sense of autonomy and resolve. This made it more difficult for economic development to take place. The impact of the telegraph is a case in point. Because of high costs, telegraph use was confined largely to businesses and the press; few people used it for social communication, at least in the United States. Among the press, the telegraph fostered the standardization and central processing of news reports, allowing all Americans to read the same national and international news stories for the first time. But standardized content diminished the community's importance in the eyes of local citizens, while centralization shifted the locus of control from local editors to national press association headquarters and bureaus.[11]

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[7] As Richard DuBoff has described, "...The telegraph dramatically enlarged information networks; it saved time, reduced the need for large inventories, decreased financing requirements, and prompted elimination of middlemen. But 'competition' and 'monopoly' are not, as neoclassical theory implies, polar opposites. The telegraph improved the functioning of markets and enhanced competition, but it simultaneously strengthened forces making for monopolization. Largerscale business operations, secrecy and control, and spatial concentration were all increased as a result of telegraphic communication." DuBoff, op. cit., footnote 5.

[8] Theodore Peterson, *Magazines in the Twentieth Century*, 2d ed. (Urbana, IL: University of Illinois Press, 1964), pp. 1-43. For a discussion of Rural Free Delivery, see *RFD: The Changing Face of Rural America* (Bloomington, IN: University of Indiana Press, 1964).

[9] The emergence of a special kind of syndicate, called readyprint companies, worked to encourage the development of national advertising and a national marketplace. By buying paper in bulk, inserting ads from national marketers, and printing in centralized plants, these readyprint firms furnished weekly newspapers with bundles of half-printed sheets for barely the cost of the blank paper. But to take advantage of the economies of scale presented by readyprint, local editors had to relinquish control over half of their news and advertising columns. Advertising agencies discovered the efficiencies of placing clients' ads with readyprint firms so their messages would appear in thousands of country papers. By 1889, a handful of companies furnished "patent insides" and "patent outsides" to 3,089 of the Nation's 8,633 weeklies. See S.N.D. North, *History and Present Condition of the Newspaper and Periodical Press of the United States* (Washington, DC: U.S. Government Printing Office, 1884), p. 94.

[10] Louis Swanson, "Rethinking Assumptions About Farm and Community," A.E. Luloff and Louis Swanson (eds.), *American Rural Communities* (Boulder, CO: Westview Special Studies in Contemporary Social Issues, 1990), p. 21. As one observer described the situation in 1850: "[Business merchants, farmers, bankers, shippers, and others soon learned the] great advantages of this mode of instantaneous communication of intelligence [which] is with them not so much as a matter of choice as of necessity, for, without availing themselves of it, they must necessarily be behind others in that which is essential to the success of their business." As cited in ibid.

[11] For a discussion of early news associations, see Frederick Hudson, *Journalism in the United States* (New York, NY: Harpers, 1873). For a discussion of the impact of the telegraph on news-gathering, see F.B. Marbut, *News From the Capital* (Southern Carbondale, IL: Southern Illinois University Press, 1976). Changes in William Allen White's *Emporia* (Kansas) *Gazette* during the 1920s illustrate some of the consequences for rural areas. According to Griffith: "The net effect, then, of the *Gazette's* increased advertising and greater access to syndicated materials was to diminish the very centrality of its community. Emporians could no longer gain the impression from reading their local newspaper that Emporia—or their own lives—mattered much in the scheme of things.... [The community's citizens] may also have been aware of a concomitant waning of a sense of the legitimacy of their day-to-day lives. For, rather than focusing on local events, the paper dramatized far-away people and places. Instead of recording the life passage of their neighbors, it reported the abnormality of strangers." As cited in Kielbowicz, op. cit., footnote 2.

Rural experience with the telephone was notably different, however. Although for businesses the telephone continued to accentuate the effect of the telegraph, for individuals, it reinforced social interaction at the local level. Between 1907 and 1927, the average person's local point-to-point communication—letters, telegraphy, and telephony—increased primarily because of growing telephone use.[12] This reinforcement of social interaction at the local level played "a part in the preservation and even in the enhancement of local patterns of attitude, habit and behavior, and serve[d] as an inhibitor of the process of cultural leveling which is so often assumed as an outstanding and unopposed tendency of American life."[13]

The value of telephony to rural communities and markets was reflected in penetration levels: some Midwestern States had more phones per-capita than Eastern States. The benefits of the telephone were many: rural households used the phone to summon doctors, visit each other, obtain weather reports, learn about sales in towns, and follow prices for agricultural commodities in local or regional markets.[14] Not surprisingly, residents of rural areas heralded the telephone's potential to end their isolation. While American Telephone and Telegraph (AT&T) promoted the development of the long-distance network, a number of towns and cities launched their own systems. Impatient with the slow deployment of lines, some farmers even constructed crude systems using barbed wire attached to fence posts.

This brief look at how previous communication technologies affected rural America reinforces the notion that sorting out the effects of deploying new communication technologies is a complex and complicated business. Different technologies have different impacts, depending on their capabilities and the circumstances under which they are deployed. While the telegraph generally undermined rural America's independence and its influence vis-à-vis other areas, the telephone tended to reinforce it.

One should keep this lesson in mind in considering how the new communication technologies will affect the prospects of rural economic development, and in determining what, if anything, policymakers need to do about their deployment. Without making reference to the characteristics and capabilities of new technologies, or to the socioeconomic context in which they are deployed, these technologies will likely give rise to a number of unintended consequences. Thus, policymakers at all levels of government must try to determine the particular circumstances under which rural areas—in all of their many varieties—might gain a fair share of the economic benefits afforded by information-age technologies.

The need to understand this issue is becoming increasingly acute. Not only is the communication infrastructure being altered in response to technological advances and regulatory changes; the strategic value of having access to communication and information services is also greater than ever before. Because people living in rural areas are today inextricably linked to external events and conditions, policymakers must consider how the evolution of the communication infrastructure might affect them.

Recent Regulatory, Marketplace, and Technological Developments Affecting the Evolution of the Communication Infrastructure

The breakup of the Bell Telephone System radically altered the U.S. communication infrastructure. This event has major consequences for rural America because it undermined the pricing structure that traditionally supported rural communication services. Divestiture also shifted a great deal of communication decisionmaking from the government policymaker to the business user. As a result, rural users' needs and interests may not be taken sufficiently into account. Rural users are not well represented among large business users.

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[12] In 1907, an average of 4.5 months elapsed between each toll telephone call but only 3 days between each local call. Malcolm Wiley and Stuart A. Rice, *Communication Agencies and Social Life* (New York, NY: McGraw Hill, 1935).

[13] Ibid., pp. 153-154.

[14] These latter two applications were among the few by which the telephone enhanced the competitive position of small producers and retailers. For discussions of the impact of telephony on rural communities, see Wiley and Rice, op. cit., footnote 12; Michael Olsen, "But It Won't Milk the Cows: Farmers in Colfax County Debate the Merits of the Telephone," *New Mexico Historical Review*, vol. 61, January 1986; and Ithiel de Sola Pool, *Forecasting the Telephone: A Retrospective Technology Assessment of the Telephone* (Norwood, NJ: Ablex Publishing Co., 1983).

The regulatory agreement that Theodore Vail, General Manager of AT&T, worked out in 1910, gave rise to the Bell System, which had as its operational goal, "one system, one policy, universal service." As Vail described his vision of the telephone industry in the *Annual Report of 1910*:

> The position of the Bell System is well known . . . The telephone system should be universal, interdependent and intercommunicating, affording opportunity for any subscriber of any exchange to communicate with any other subscriber of any other exchange . . . annihilating time or distance by use of electrical transmission.[15]

Comprised of AT&T and its subsidiaries and affiliates, the Bell System offered a complete range of telecommunication services including research and development, equipment manufacturing and sales, local and long-distance services, as well as access to international transmission service. Having a total of $150 billion in assets in 1983, prior to divestiture, it constituted the world's largest corporation.

The regulatory framework that governed the Bell System and remained intact for more than half a century was decidedly American. While operating in a capitalist framework, it provided some social control over the negative impacts of the single-mindedness of the marketplace.[16] Moreover, taking the form of a monopoly, the Bell System provided for interoperability and was able to take advantage of economies of scale and scope.[17] By most accounts, this system worked well.[18]

From the perspective of rural America, the most important aspect of the Bell System was its provision for subsidies. To subsidize the expansion of telephone services, AT&T adopted a pricing structure based not on cost of usage, but rather on value of use. Such a system assured that toll users (disproportionately represented by business users) would pay some proportion of the nontraffic-sensitive (the fixed) costs of the local exchange. The formula for establishing the amount and distribution of these costs was inexact. Therefore, the tendency over time was to shift more of the service costs from local exchange users to toll users. Increasingly, this formula fostered residential service at the expense of long-distance users.[19]

By continuing to adjust the cost allocation formula in favor of the local exchange, the Federal Communications Commission (FCC) and AT&T created a situation where the costs and prices of telecommunication services were increasingly dissociated from one another. In 1941, the FCC adopted a policy of "equal charges for equal service" that was intended to eliminate interstate rate differentials.[20] This rate-averaging system worked in favor of rural customers whose long-distance service was generally more costly per call.

These subsidies served well as a means of fostering the development of universal telephone service. The prospect of attaining the goal of universal service was well in sight by 1950, with 80 percent of American homes equipped with telephones.[21] By 1952, AT&T operated almost entirely under a nationwide average pricing system. However, for political as well as economic reasons, subsidies such as these could only be sustained under a regulated monopoly. Over time, the policy of maintaining the telephone monopoly became less and less viable.

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[15] As cited in Richard Vietor, "AT&T and the Public Good: Regulation and Competition in Telecommunications," Harvard Business School, unpublished paper, April 1987, revised March 1988, p. 3.

[16] Michael D. Reagan, *Regulation: The Politics of Policy* (Boston, MA: Little, Brown, and Co., 1987).

[17] Vietor, op. cit., footnote 15, p. 17.

[18] As Glen Robinson has pointed out: ". . . She [Ma Bell] was held in fairly high regard. In contrast to other monopolists we've loved to hate—railroads, gas utilities, broadcast stations, and countless other enterprises with protected market positions—AT&T's monopoly seemed not only natural but relatively benign. . . . The system pioneered and developed by AT&T was justly acclaimed the world's finest. Telephone rates were comfortably affordable; furthermore, in the heyday of the telephone monopoly the rate system was generally perceived as fair. Service innovation, while not rapid, nevertheless did proceed more rapidly than in other sectors of the economy." Glen O. Robinson, "The Titanic Remembered: AT&T and the Changing World of Telecommunication," *Yale Journal of Regulation*, vol. 5, 1988, pp. 517-518.

[19] Some have argued that, in the long run, given technological changes and efforts to upgrade the network for the business user, this subsidy has actually worked in reverse. According to Pat Aufderheide, for example: "Cost shifting is justified on the grounds that the individual user is the 'cost-causer' and that the local loop must now 'pay for itself.' This rationale ignores the changing pattern of technological costs. More elaborate and sophisticated digital switching equipment, making possible services of great immediate value to large users and increasing capacity to carry huge data transmission demands, incurs tremendous investment costs while lowering the cost of switching and transmission." Patricia Aufderheide, "Universal Service: Telephone Policy in the Public Interest," *Journal of Communications*, vol. 37, No. 1, Winter 1987, p. 83.

[20] Vietor, op. cit., footnote 15, p. 23.

Technological developments helped undermine the traditional Bell System. With the convergence of information (computers) and communication (telephones) technologies, there was no clear distinction between a monopoly—and hence regulated—service, and competitive market-driven services. This convergence led to changes in network architecture, with the intelligence (control) being increasingly dispersed. As a result, network unbundling (purchasing separate, individual services) was greatly facilitated. As new technologies increased in capability and declined in cost, the barriers to entry into the telecommunication market were reduced. Under these circumstances, newcomers were able to make significant inroads into AT&T's traditionally protected market. Their chances for success were greatly enhanced because AT&T was required to provide universal service while its competitors could target products and services for the lucrative business markets and offer them at a lower price. Thus, competitive entry put pressure on the subsidy pricing system that had been elaborately constructed over the years.

Economic developments also greatly increased the incentives for others to enter the telecommunication/data communication market. As information came to play a more important, strategic role in business, large users sought alternative, more efficient ways of purchasing telecommunication services.[22] Where their needs were great, or where they wanted more control over their operations, users created their own internal telecommunication networks. In other cases, business users were able to make the best deal by bypassing the Bell System and purchasing services and equipment in the unregulated market. Since expenditures on these services constituted an increasing portion of their overall business expenses, large users had tremendous stakes in how the telecommunication regulatory structure evolved. Recognizing this, they joined forces with the burgeoning new service providers to press for greater competition.[23]

Changes were also taking place in the way regulators viewed the regulatory system.[24] As early as 1962, a number of regulatory economists began to question the public utility concept. Together, their work—if it did not itself give rise to the new deregulatory climate—served at least to legitimate it.[25] This changed attitude was also evident at the FCC.[26]

Although perhaps not fully aware of the final outcome of its actions, the FCC took its first steps toward divestiture and the Modified Final Judgment (MFJ) in 1959 with its "above 890" decision. This decision, which liberalized the licensing of private microwave systems, allowed the newly created Microwave Communications, Inc. (MCI) to offer a new product—discount private-line service.[27] With the subsequent Carterfone decision in 1969, the FCC also opened the customer-premises equipment market to entry. Finally, with the decisions on Execunet in 1976 and 1978, requiring AT&T to provide connections to MCI, the FCC struck a final blow to the 100-year-old AT&T monopoly by opening the long-distance telecommunication market to competition.

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[21] It should be noted that the goal of providing universal telephone service was greatly facilitated by Federal support of independent rural telephone companies. In response to a decline between 1920 and 1940 in the number of farms that had telephones, Congress, in 1947, authorized the Rural Electrification Administration to make low-interest loans to persons, public bodies, and cooperatives to improve and extend telephone service in rural areas. By the end of 1985, REA had provided loans or loan guarantees to approximately 1,000 small, independent rural telephone companies totaling $7.7 million. U.S. General Accounting Office, *Issues Affecting Rural Telephone Service* (Washington, DC: Mar. 17, 1987), p. 12.

[22] For a discussion of the changing role of large business users, see Dan Schiller, "Business Users and the Telecommunication Network," *Journal of Communications*, vol. 32, No. 4, autumn 1982, p. 35.

[23] Ibid.

[24] For one discussion, see Alfred E. Kahn, "The Passing of the Public Utility Concept: A Reprise," Eli Noam (ed.), *Telecommunications Regulation Today and Tomorrow* (New York, NY: Harcourt Brace Jovanovich Publishers, 1983), ch. 3.

[25] See, for instance, Roger G. Noll, "Regulation After Reagan," *AEI Journal on Government and Society*, No. 3, 1988, pp. 13-20.

[26] As the former FCC Commissioner Nicholas Johnson noted when the FCC decided to approve MCI's application to set up a long-distance private-line service: ". . . I am not satisfied with the job the FCC has been doing. And I am still looking, at this juncture, for ways to add a little salt and pepper of competition to the rather tasteless stew of regulatory protection that the Commission and Bell have cooked up." *Microwave Communications, Inc.*, 18 FCC 2d, 953, 971-972.

[27] *Allocation of Frequencies in the Bands Above 890 MHz*, 27 FCC 359 (1959) 29 FCC 190 (1960).

Implications of a New Regulatory Framework for Rural America

The divestiture of the Bell System undermined the pricing structure that traditionally supported rural communication services. In particular, it led many communication providers to price access closer to real costs and to base their prices on measured usage, thereby eliminating the sources of subsidies.[28] In this deregulated climate, where competition is allowed and fostered, differences between costs and prices are untenable. Wherever prices are kept artificially high, users will seek alternative, private solutions to meet their communication needs.

To avoid the bypass of the public telecommunication network, the FCC is shifting costs from interstate interexchange service to local exchange service by imposing subscriber line charges and by limiting the interstate share of local plant costs assigned to interstate calls. Making the local exchange companies responsible for a larger share of the nontraffic-sensitive costs (NTS)[29] is likely to affect low-density rural areas more than high-density urban areas because these costs tend to be higher in rural areas. In the past, rural telephone companies allocated as much as 85 percent of NTS costs to the long-distance, interexchange carriers. Under FCC's new provision, they can allocate no more than 25 percent. The newly imposed subscriber line charges are intended to eventually make up for past subsidies.

The amount of subsidy available for communication services is also likely to decrease in the future as business-users, who have traditionally subsidized rural users, leave the public network to set up their own telecommunication systems. Under such circumstances, less money will be available to support publicly shared communication services. Similarly, if communication services that were once provided through the public network, and thus served to cross-subsidize one another, are unbundled and sold in the marketplace, many small users may have to pay much more for services.

Changes in the communication infrastructure have also increased the transaction costs (design, installation, standardization) that rural residents and businesses have to pay to take advantage of new communication technologies and networks. In the past, many transaction costs, especially in telecommunication, were hidden. For example, as part of the product they sold, providers of telephone services included their technical expertise and assured interconnection and connectivity. In addition, they provided services such as directories, maintenance, protocols, and routing. Today, while residential and business users benefit from a greater choice of communication services, they must absorb these transaction costs on their own.

Many businesses regard this post-divestiture development as an opportunity to employ their communication and information systems strategically as a competitive, economic weapon. However, assembling and maintaining a communication network is costly, and requires considerable expertise and technical skill, as many businesses developing their own private networks have discovered. Whereas in the past, vendors performed a number of key functions—e.g., providing network management, developing industry standards, designing system architecture, planning the introduction of new technologies, and evaluation and assessing alternative products and services—today these tasks are the responsibility of the business-users themselves.[30]

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[28] One of the most serious problems results from the "deaveraging" of toll rates. With deaveraging, a call of equivalent distance would cost more on a low-volume rural route than would a call on a high-volume urban route. In this case, long distance rural calling would diminish along with the toll incomes of the rural telephone companies. Large business customers and telephone companies also wish to reduce toll settlement payments to small telephone companies. These events may not only hinder rural network modernization and service quality, they may also threaten the very survival of many rural telephone companies. Bruce Egan, "Bringing Advanced Telecommunications to Rural America: The Cost of Technology Adoption," contractor report prepared for the Office of Technology Assessment, October 1990.

[29] Nontraffic-sensitive costs are those costs that a local telephone company incurs in providing its subscribers with a connection to the company's central offices. The nontraffic-sensitive portion of the company's plant is largely comprised of the telephone lines (referred to as "local loops") running from the subscribers' premises to these central offices. A company's nontraffic-sensitive costs primarily depend on the number of its subscribers and the average length of its subscribers' local loops. Nontraffic-sensitive costs do not vary with the amount of telephone traffic carried over the loops, which is why they are generally considered "fixed" costs.

[30] To meet the needs of business-users, new companies are emerging and old ones are reorganizing to better position themselves to take part in what is now a very lucrative systems integration market. According to the market research firm, International Data Corp., the system integration market is growing at an estimated annual rate of 20 percent, with revenues increasing from $8 billion in 1987 to $22 billion in 1993. Mark Breibart, "Systems Integration Surge," *Computer World Focus on Integration*, special issue, Feb. 6, 1989, pp. 29-33.

Shifting the burden of transaction costs to the communication-user raises questions of fairness. In particular, it is likely to disadvantage rural areas, where few businesses will be able to assume these transaction costs.

Aware of the problems that rural areas might face in a post-divestiture environment, the Federal and State governments took a number of actions to alleviate some of them. For example, within a year of divestiture, the FCC initiated a targeted subsidy program that waived all of the monthly $2 Federal subscriber line charges if the State contributed at least another $2 to reducing an eligible subscriber's monthly bill. In addition, the Universal Service Fund was established to reduce the impact of divestiture on high-cost subscribers. It allocated about $180 million to high-cost areas in 1988. In April 1987, the FCC began the Link Up America program—using funds from charges on long-distance carriers to contribute up to $30 towards installation fees. The Rural Electrification Administration also provides direct subsidies to rural telephone companies in the form of low-interest loans. A number of States also provide subsidies. For example, in 1983, California adopted a Lifeline plan, according to which customers with incomes below specified levels obtain a 50 percent discount on basic local service plus other benefits.[31]

While these measures may limit the negative impact of deregulation with respect to providing rural citizens "plain old telephone service," they are unlikely to deal with the problem of how new capabilities are to be deployed throughout the network in the future. To understand the magnitude of this problem, one must look first at the condition of the rural communication infrastructure as it is evolving today.

The Rural Communication Infrastructure

It is useful to subdivide information-age technology into information technologies, access and transmission technologies, and switching and networking technologies. It is important to note, however, that the boundaries among them are not always clear cut, and are eroding in the face of technological change.[32]

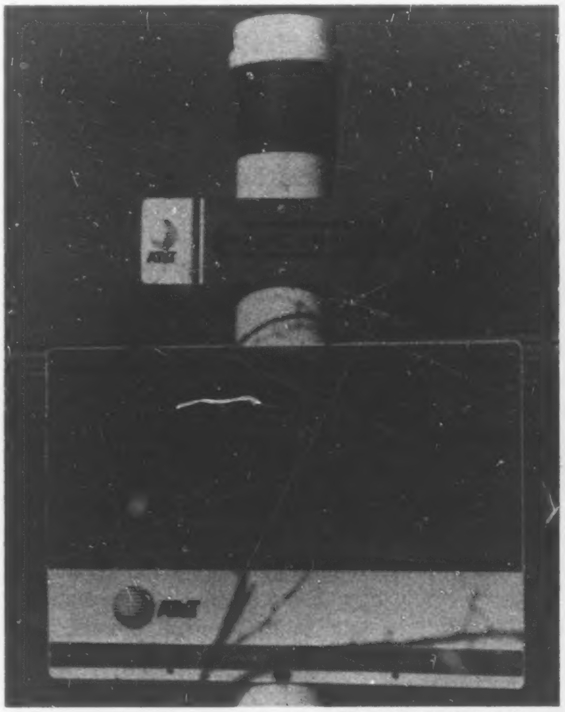

Photo credit: Mark G. Young

A sign marking the route of AT&T's intercontinental cable through Bowling Green, KY.

Information technologies allow individuals to store, process, and reorganize data into a more useful form. Examples include computers, modems, facsimile machines, and answering machines. Access and transmission technologies are the means by which individuals can transmit or receive information from other individuals or information systems. Some examples are cables, radio waves, and satellites. Network technologies are the means by which transmitted information can be managed, routed, and interconnected. These include, for example, switches, bridges and routers, local area networks (LANs), and signaling systems.

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[31] See for a discussion, Leland L. Johnson, *Telephone Assistance Programs for Low-Income Households: A Preliminary Assessment* (Santa Monica, CA: Rand Corp., R-3603-NSF/MF, 1988).

[32] With the deployment of fast packet-switching and the integration of further intelligence into the telecommunication network, it will become increasingly difficult to distinguish between the functions of switching and transmission. See Gihong Kim, "The Evolution of Transmission Systems for the Next 10 Years," *Telecommunications*, Aug. 10, 1987. Some examples noted by the author are statistical multiplexers, digital cross-connect systems, concentrators, and switches with built-in optical interfaces such as DS3. See also, A.M. Rutkowski, "Telecommunication Sandcastles: Boundaries That Have Outlived Their Usefulness," *Telecommunications*, June 1987, p. 8; and Richard Solomon, "Broadband ISDN: With Computers, the Sum Is Always Greater Than the Parts," *International Networks*, vol. 5, No. 2, Sept. 5, 1987.

Information Technologies

Information technologies encompass a vast array of storage and processing devices. The most important is the personal computer. In 1989, there were 16 million personal computers deployed in business, 20 million in residences, and 2 million in the educational and scientific communities.[33]

Computer applications are also multiplying rapidly due to increased storage and processing capacity,[34] the dispersal of intelligence throughout communication systems,[35] as well as digitalization and the convergence of media.[36] According to one estimate, by 1993, office workstations will be able to handle 32 million instructions per second; have 16 megabytes of random access memory, and cost approximately $350.[37] Given such performance/price improvements, market analysts expect that, by the early 1990s, the total number of computer workstations in Europe, Japan, and the United States will surpass 100 million.[38] Many of these will soon provide multimedia access at the desktop[39] (see box 3-A).

Rural areas have been much slower than urban areas to adopt information-age technologies.[40] There are a number of reasons for this lag. One is cost. Even when the price of customer premises equipment is not excessive, the cost of network access and transmission can be prohibitive. To access major databases, or to network their computers, people living in rural areas generally have to make long distance calls. In urban areas, this is often not the case.[41]

The poor quality of the rural infrastructure also inhibits the use of information technologies. As discussed below, in many rural areas the communication infrastructure is still unsuitable for simple data transmission. With faster speeds and more powerful applications, the need for a high-capacity, high-quality infrastructure will be even greater. CAD-CAM applications, for example, require broadband capacity of 45 megabits per second.

The lack of technology awareness and expertise also helps explain the low levels of computer ownership in rural areas. Rural people who own computers have more education, income, and professional experience than those who do not.[42] Although information technologies are becoming

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[33] Mark Cooper, *Expanding the Information Age for the 1990's: A Pragmatic Consumer Analysis*, written for the American Association of Retired Persons and the Consumer Federation of America, Jan. 11, 1990, pp. 15-16.

[34] A critical factor in this regard has been the rapid advances in microelectronics resulting from the development of very large scale integration (VLSI). VLSI allows the placement of over 10^6 logical operations on a single integrated circuit chip, and this number is doubling every 18 months. Given this level of integration, communication within computers can take place much more rapidly and efficiently; bits no longer have to travel between chips over shared buses when the source and destination both reside on the same chip. Over the past 20 years, chip densities have increased several orders of magnitude. See, for a discussion, Debra Estrin, ''Communication Systems for An Information Age: A Technical Perspective,'' contractor report prepared for the Office of Technology Assessment, December 1986.

[35] More and more systems are becoming defined and driven by software. This development will make future communication technologies and systems more flexible and more versatile. See, for a discussion, U.S. Congress, Office of Technology Assessment, *Critical Connections: Communication for the Future*, OTA-CIT-407 (Washington, DC: U.S. Government Printing Office, January 1990), ch. 3.

[36] As Stewart Brand has described this phenomenon: ''With digitalization all of the media become translatable into each other—computer bits migrate merrily—and they escape from their traditional means of transmission. A movie, phone call, letter, or magazine article may be sent digitally via phone line, coaxial cable, fiber optic cable, microwave satellite, the broadcast air, or a physical storage medium such as tape or disk. If that's not revolution enough, with digitalization the content becomes totally plastic—any message, sound, or image may be edited from anything into anything else.'' Stewart Brand, *The Media Lab: Inventing the Future at MIT* (New York, NY: Penguin Books, 1988), p. 19.

[37] Denis Gilhooly, ''Welcome to a Future Where Less Is More,'' *Communications Week*, CLOSEUP, Sept. 4, 1989, p. C4.

[38] Ibid.

[39] Although currently in its infancy, the multimedia industry is growing rapidly and expected to constitute a $7 billion market by 1994.

[40] Don Dillman et al., for instance, showed that people living in Washington State's rural counties tended to own fewer information technologies that might be used in business applications. Don Dillman, Leali Peterson Scott, and John Allen, *Telecommmunications in Washington: A Statewide Survey*, for the Joint Select Committee on Telecommunications of the Washington State Legislature, Social and Economic Science Research Center, Washington State University, Pullman, WA, January 1987, p. 17.

A similar study by Clifford Scherer compared computer ownership in metropolitan and nonmetropolitan New York. It found that 18 percent of the people living in metropolitan counties owned computers as compared to 14 percent in nonmetropolitan counties. Clifford Scherer, *Data Book: A Study of New York State Residents—Getting Information for Daily Living*, Department of Communication, Cornell University, Ithaca, NY, 1988.

[41] Paul Yarborough, ''Information Technology and Rural Economic Development: Evidence From Historical and Contemporary Research,'' contractor report prepared for the Office of Technology Assessment, May 1990.

[42] Ibid., p. 22.

Box 3-A—Computer-Aided Design

Computer-aided design is becoming the norm for businesses to efficiently design and test products and design and monitor the machines and factories that make and assemble the products. With the help of computers, designs for buildings, machines, consumer products, semiconductor components, etc. are electronically simulated and tested. CAD/CAM (computer-aided design/manufacturing) replaces the construction and testing of actual models. Because designs are stored in electronic form rather than on paper, they can be quickly and easily updated and transferred.

Integraph Corp. recently introduced a product, the CAD Conferencing Module, that permits people at as many as eight different locations to simultaneously view and edit computerized blueprints and designs. Engineers and designers, for example, can simultaneously and interactively work in real time on a file with each other or with a client. The electronic blueprints are transmitted and loaded into each of the separate workstations so that they can be called up during the networked conference to be viewed and edited. Modifications to the still-frame image, such as zooming or highlighting features, by one person are registered at all the participating workstations. This conference arrangement expedites the design and engineering process by minimizing the encumbrance of mailing blueprints back and forth, and increasing the communication between the firms' various departments.

SOURCE: Charles Bruno, "Intergraph Ushers in CAD Conferencing Era," *Network World*, Nov. 12, 1990, p. 37.

more user-friendly, the difficulties entailed in linking technologies and systems will likely continue to discourage use.

Access and Transmission Technologies

Access and transmission technologies transport information among and between other users and networks. They may provide point-to-point interconnection, as in the case of the telegraph and the telephone; point-to-multipoint interconnection, as in the case of radio and television; or multipoint-to-multipoint interconnection as in the case of bulletin boards, electronic mail systems, and local area networks (LANs). These technologies can have either one-way or two-way capabilities.

Telephony

Telephony is by far the most important and ubiquitous two-way medium for transmitting information. There are today, in the United States, over 1,300 telephone companies and a total of 130 million access lines. The top 25 companies account for 90 percent of the access lines. The Bell telephone companies serve about 80 percent of the market with about 50 percent of all central offices. The remaining companies are quite small by comparison.

A wide variety of new and more specialized service providers have emerged since divestiture. For example, some providers, such as Telenet and Tymnet, sell packet-switched data communication services.[43] Other carriers specialize in high performance, point-to-point T1 service.[44] And others, such as Teleport and Metropolitan Fiber Systems, provide metropolitan area networking (MAN) services. Many private businesses have also taken advantage of the unbundling of the communication network and the availability of a wide range of new, advanced products to develop their own communication systems.

In rural areas, about one-half of all service is provided by small independent telephone companies, with the Bell operating companies (BOCs) providing 53 percent.[45] Few, if any, of the larger or more specialized providers are trying to enter or develop rural markets. Given a highly competitive, post-divestiture environment, they are focusing their efforts on the more lucrative business market, generally to be found in urban areas. The regional Bell operating companies (RBOCs), for example, have been concentrating on the deployment of their switched multimegabit data service (SMDS)[46] in an effort to forestall bypass by alternative providers.

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[43] Packet-switching makes efficient use of a transmission channel. It breaks messages up into small bundles, or packets, each of which carries with it its own address; then interleaves them on a channel, taking advantage of the "silences" present in the information stream, and finally routes them throughout the network to their destination where they are reassembled.

[44] T1 circuits operate at 1.544 megabits per second and consist of 64 kilobits per second voice or data, plus a framing bit. For a description see, Victoria A. Brown, "T1 Networking and Open Systems," *Telecommunications*, January 1989, p. 56.

[45] REA provides investment and financial data for over 900 small telephone companies serving over 5 million customers in very thin markets. This data is considered for the purposes of this report to be representative of "rural" subscribers.

[46] SMDS is a high-speed, fast packet-switched service provided in a campus type arrangement situated within a 50-mile radius.

The RBOCs' early ISDN trials were also conducted to the same end with large business users located in metropolitan areas.[47] This urban focus means that even when rural businesses are large enough to economically justify the delivery of advanced services, they are often the last to be served. This can have a spiraling effect, since businesses sometimes will not locate in rural areas for lack of an adequate communication infrastructure.[48]

A comparison of the circumstances under which urban and rural telephone companies operate illustrate some of the problems of providing service in rural areas. Costs are higher in rural areas because, with low-density populations and low-volume traffic dispersed over large areas, costs are harder to share. The Bell companies, which serve primarily urban areas, have about 10,000 lines per central office, whereas REA borrowers—generally the smallest of the independents—average only 2,500 lines per central office.

Moreover, whereas Bell companies have, on average, almost 130 subscribers per route mile of outside plant, REA companies average only 6.[49] In addition, the average length of a large company's subscriber loop (the wire between the central office and the user's premises) is about half that of REA companies (10,787 v. 20,330 feet).[50] The Bell companies also have many more higher paying business access lines than rural companies. Not surprisingly, revenue per line for small companies is $682 per year or $56 per month, as compared to $757 per year, or $63 per month for large companies. If rural telephone companies did not have significant cost efficiencies relatively to large companies,[51] or access to low-cost financing through REA, the gap between urban and rural telephone revenues would likely be higher.

The quality of rural access is also inferior to that in urban areas. Poor quality stems, in part, from the number of multiparty lines still found in rural areas. Multiparty lines cannot transmit data because of possible interruptions. Although their number is declining, multiparty arrangements are much more prevalent in rural areas than in urban areas. In 1987, multiparty lines accounted for only 1.2 percent of Bell access lines as compared to 7.4 percent of independent telephone companies' access lines.[52]

Long local loops also diminish the quality of rural access. When loops exceed 18,000 feet, they require special treatment to maintain the quality of voice transmission. Loading coils are used, for example, to reduce voice frequency attenuation and range extenders are used to amplify a distant voice signal. But these treatments limit the usefulness of the line for data. Loading coils, which are present on about 40 percent of all rural subscriber loops, introduce delay distortion that limits data transmission to a few hundred bits per second. And range extenders may garble data, requiring retransmission.[53]

Advances in technology are helping to reduce the costs and improve the quality of access in rural areas. One important development has been advances in loop plant technology. Of great importance has been the introduction of the serving area concept in current plant designs. This design was first introduced by the Bell System and adapted for use in rural areas by REA companies in the mid-1970s. In accordance with this design, logical groupings of subscribers are arranged so that they can be served by relatively short and large pair-size distribution cables from an intermediate field location called a Serving Interface Point.[54]

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[47] Carol Wilson, "PacBell Launches Primary Rate ISDN," *Telephony*, Dec. 10, 1990, p. 11.

[48] For such instances, see *Telecommunications and Rural Economic Development* (Redondo Beach, CA: MESA Consulting, Oct. 30, 1990).

[49] U.S. Department of Agriculture, "1988 Statistical Report, Rural Telephone Borrowers," REA Bulletin #300-4, 1989.

[50] Egan, op. cit., footnote 28.

[51] One reason for the REA companies' relatively low costs is the savings from arrangements to share large company toll facilities and traffic and billing systems. Thus, these operations are treated as operating expenses, while the same activity for a large company may require capital outlays. Nevertheless, even operation and maintenance expenses per line are consistently and significantly lower for smaller companies. Large companies have a more mobile access line base, and service quality on their loops tends to be higher (while their loops are shorter). Moreover, labor costs for both craft and management functions are much smaller for rural telephone companies.

[52] Edwin B. Parker, *Rural America in the Information Age: Telecommunications Policy for Rural Development* (Lanham, MD: University Press of America, Inc., 1989), p. 69. The actual number of multiparty lines may overestimate the number of persons or firms for whom such service is a hindrance. Many customers with multiparty lines do not use them for data transmission and may voluntarily choose multiparty lines over single-party lines in order to pay lower rates.

[53] Egan, op. cit., footnote 28, p. 47.

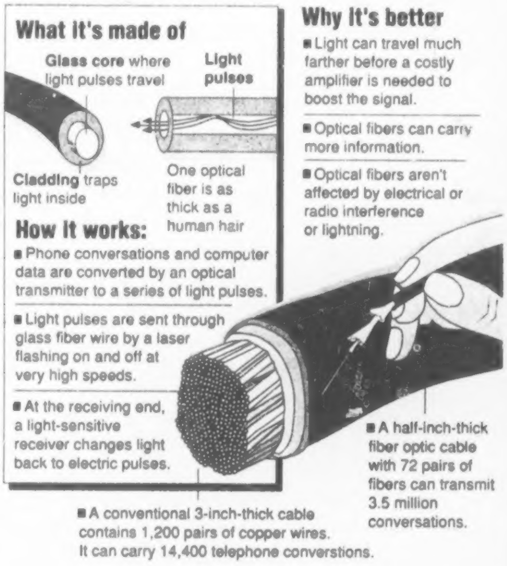
Two significant developments in loop technology—the introduction of loop carrier systems and digital remote electronics and switching technology—helped implement this design. Loop carrier systems concentrate access lines by combining many customers into one or more shared trunks. Previously, each customer needed a dedicated (nonshared) loop. The introduction of digital switching reduced the amount of dedicated loop plant by allowing remote nodes to be connected to the host digital switch.

The deployment of fiber optics will also greatly improve rural access. Fiber optics generally provide more capacity, reliability, flexibility, and functionality than existing metallic cable. With minimum transmission loss, fiber allows more signals to travel over longer distances with smaller numbers of repeaters than does copper wire.[55] Thus it can support new broadband applications such as video telephony, multi-media services, and very high speed data services (see box 3-B). Already, commercial systems have been developed that transmit 1.7 billion bits of information per second on a single pair of glass fibers, an amount equivalent to 24,000 simultaneous phone calls. And the capabilities of lightwave transmission are doubling every year, a trend that is likely to continue for at least a decade.[56]

Box 3-B—Fiber Optics

Fiber optics: Changing communication

This new technology uses light pulses traveling though glass fiber to transmit information. Conventional telephone cable uses electricity traveling through copper wire.


What it's made of
Glass core where light pulses travel
Light pulses
Cladding traps light inside
One optical fiber is as thick as a human hair
How it works:
Why it's better

How it works:

- Phone conversations and computer data are converted by an optical transmitter to a series of light pulses.
- Light pulses are sent through glass fiber wire by a laser flashing on and off at very high speeds.
- At the receiving end, a light-sensitive receiver changes light back to electric pulses.

Why it's better

- Light can travel much farther before a costly amplifier is needed to boost the signal.
- Optical fibers can carry more information.
- Optical fibers aren't affected by electrical or radio interference or lightning.

- A half-inch-thick fiber optic cable with 72 pairs of fibers can transmit 3.5 million conversations.
- A conventional 3-inch-thick cable contains 1,200 pairs of copper wires. It can carry 14,400 telephone converstions.

SOURCE: Judy Treible, Knight-Ridder Tribune News, adapted from *Popular Science Magazine, World Book Encyclopedia,* and *The Re-Wiring of America.*

Constraints on the deployment of fiber are clearly economic, not technological. Although fiber is increasingly being used for interoffice trunk lines, and even in some local loop facilities for business users, it will not likely be extended to the home (with the exception of new construction) for a number of years.[57] Fiber loop systems are still uneconomical for most of the residential communities; splicing and cabling costs are still high.[58] The residential demand for fiber in the local loop also remains uncertain; most residential service can be provided through the existing network, or as in the case of video services, through alternative distribution channels such as cable TV and videocassette recorders.[59]

The deployment of fiber will be driven by business demand. It is cost-effective for businesses to adopt fiber long before residential users, because they typically share network facilities among a number of telephones. However, rural businesses may be unable to drive demand because they are generally too small in size. To have such an impact, they will need to pool their demand, either with other businesses or other large users within a community.

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[54] Relatively long feeder cables connect the SIP to the central office switch. Subscriber circuits are created by cross-connecting pairs from the feeder and distribution cables to the SIP points. Egan, op. cit., footnote 28.

[55] Commercially available fiber optic technology operates in the 500 million megabits-per-second range. Rates should increase in the future with the use of single mode fibers and coherent modulation/demodulation schemes. Estrin, op. cit., footnote 34, p. 17.

[56] Eric E. Sumner, "Telecommunications Technology in the 1990s," *Telecommunications,* January 1989, p. 38. See also, Lee Greenfeld, "Optical Computing," *Computerworld,* June 26, 1986, pp. 83-89; and Estrin, op. cit., footnote 34. In the future, the use of laser systems and wavelength division multiplexing on a single fiber will push transmission capabilities into the range of 20 gigabits per second. With wave division multiplexing, each fiber optic cable can accommodate multiple channels by assigning each data stream a different wave length or color.

[57] For one discussion, see Robert Pepper, "Through the Looking Glass: Integrated Broadband Networks, Regulatory Policies, and Institutional Change," working paper No. 24, Federal Communication Commission, Office of Plans and Policy, 1988.

[58] To speed up the deployment of fiber, providers are focusing on the intermediate step of delivering fiber to the curb.

[59] For discussions, see Graham Finnie, "The Disciples of Fiber," *Telecommunications,* and Graham Finnie, "Lighting Up the Local Loop," *Telecommunications,* January 1989, pp. 31-32, 37-38, 40; and Lloyd F. Brisk, "Neighborhood Fiber: Putting a Laser in Everyone's POTS," *Telephony,* Feb. 20, 1989, pp. 27-28.

Cable Television

Cable television is an important one-way communication system serving rural areas. The Community Antenna Television Association (CATA) estimates that cable penetration (homes passed) in rural areas is higher than in urban and suburban areas [about 60] percent). However, while the actual subscription rate in nonmetropolitan counties may be higher than in metropolitan counties, communities with fewer than 3,000 residents had a subscription rate of only 46 percent compared to 69 percent for more populous places in the same county.[60]

Cable is valuable to rural households as a source of entertainment and access. Cable television can be accessed using wire or satellite. In urban areas, access is almost exclusively through coaxial cable provided by a cable company. In rural areas it is available primarily through coaxial cable, with 10 percent of it provided by satellite. To gain access via satellite, rural residents must buy a television receive only (TVRO) satellite dish that costs between $750 and $1,800.[61] Ownership ranges from 6 percent in the open country to 11 percent in rural mountain areas.[62]

One-way communication systems, such as cable TV, are less important to rural businesses because they do not presently support the information exchange required in most business communications.[63] They are, however, being used in the public sector, especially in schools (see box 3-C).

Box 3-C—Berks Community Television

Berks Community Television (BCTV) was created in 1977 as a nonprofit organization, supported by the citizens of Berks County, PA, and its largest city Reading (famous for the railroad to which it lent its name), to provide "to the community the best possible educational and informational programs." The programs are organized and produced by volunteers. Its programming is fed into the cable system and delivered as a regular subscriber channel.

In contrast to larger regional or national formats, BCTV uses television as a live, two-way, interactive medium that depends on audience participation and feedback. For example, BCTV, through a series of National Issues Forums raises relevant issues, such as the day-care dilemma and drug crisis, while permitting and encouraging home viewers and the studio audience to actively take part in the discussion. In addition, community agencies, such as the chamber of commerce, county bar association, and hospitals and medical firms, use BCTV "to continue their outreach, information, and referral services." Productions can be organized at two different locations and shown simultaneously on split screen.

SOURCE: Berks Community Television, Reading, PA.

Nonwireline Media

In remote areas, where the cost of providing wireline service is prohibitive, microwave, radio and satellite technologies can be used to provide less expensive access to communication services. With technological advances, these technologies provide services that are increasingly comparable to wireline service.

Microwave has long been a mainstay in telecommunications network technology. Historically, its primary use was high-capacity, long-haul toll service, and it will likely continue to be important in such

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[60] Egan, op. cit., footnote 28, p. 57.

[61] Joseph N. Pelton, "Satellite Communication for Rural and Remote Applications in the United States," contractor report prepared for the Office of Technology Assessment, December 1989, p. 13.

[62] Yarborough, op. cit., footnote 41, pp. 45-46.

[63] The coaxial cables used for CATV transmissions can transmit very wideband signals; this fact, plus the fact that a majority of U.S. residences are passed by CATV systems, has generated much interest in the use of cable television technology to offer services beyond one-way video programming, including two-way switched voice and data. The attractiveness is clear: aside from the wide availability of CATV service, the cable medium is relatively inexpensive, and electronic interface equipment for subscriber applications is also inexpensive to design and produce. There are, however, a number of regulatory concerns surrounding the issue of CATV-based local exchange telephone service, and cable companies have been slow, if not reluctant, to move in these new directions. Dale Hatfield, "Information Age Technology and Rural Economic Development," contractor report prepared for the Office of Technology Assessment, October 1989, p. 23.

Box 3-D—Digital Radio Service

In the United States, the International Mobile Machine Corp. (IMM) has developed a wireless digital radio service called Ultraphone, which is now being used to provide telephone access in a number of remote rural areas. As of the end of 1989, IMM had installed approximately 40 Ultraphone systems serving about 15,000, mainly rural, customers.

A digital radio transceiver at the customer's premises encodes the analog voice to digital format to be transmitted through the radio waves (rather than through the more traditional terrestrial copper or fiber-optic wires) to the Radio Carrier Station, where the signal is then routed to the central office switch and along the public-switched network.

Radio telephony is particularly advantageous for rural areas where the expense of extending wires to the customers—which may involve digging trenches, clearing rights of ways, or crossing difficult terrain—can become prohibitive. It is thus especially useful when extending service to only a few, widely dispersed customers. Another inherent advantage of wireless technology is that telephone companies have much greater flexibility in adding on additional customers and reconfiguring their facilities than with conventional cable routes/land lines.

Digital radio also has a number of advantages over analog radio:

- greater degree of security because of more complicated encoding schemes for the digital transmission,
- digital transmission is inherently better suited for handling data transmission,
- greater ability to operate in the presence of interference,
- higher capacity,
- time division multiplexing conserves spectrum and reduces costs because less base-station hardware is required to support a given subscriber population, and
- ultraphone is software-based and thus more open to further technological improvements.

SOURCE: George M. Calhoun, "Wireless Access and Rural Telecommunications," contractor report prepared for the Office of Technology Assessment, 1990.

markets. Recent technological advances in microwave, as well as increases in the usable spectrum for telecommunications, have made it a popular technology for high-capacity, short-haul applications. Microwave is used for both digital and analog services.

One of microwave's advantages is its relatively low construction costs for rural applications compared with other technologies. Unlike terrestrial wireline technologies, it does not require placement of physical cable plant, usually the highest component of deployment costs. Rooftops, hills, and mountains can often provide an inexpensive base for microwave towers. Unit costs of microwave service are also falling, as more high-powered systems expand the usable spectrum. Very small capacity systems with only a handful of circuits are also now available. One major disadvantage of microwave is that it requires line-of-sight of the transmission path and is subject to electromagnetic interference.

Like microwave, radio technology relies on the electromagnetic spectrum and has long been used in various forms for telecommunications and broadcasting services. Its use in providing basic rural service has only recently been approved by Federal regulators, who must approve all private uses of the spectrum.[64] This technology is sometimes referred to as the "wireless loop," and its immediate advantages in terms of speed and ease of installation are clear since there is no requirement for placing physical transmission plant. The term "radio" in this case refers to certain frequencies assigned to the service that are distinct from those assigned microwave toll service. As an over-the-air technology, radio service supports both analog and digital applications and has the same relative advantages and disadvantages as microwave (see box 3-D). Unlike microwave, rural radio provides short-haul telecommunications, and requires different power, performance, transmission, and reception capabilities and devices. Digital radio systems capable of carrying four DS3 lines—each with a capacity of

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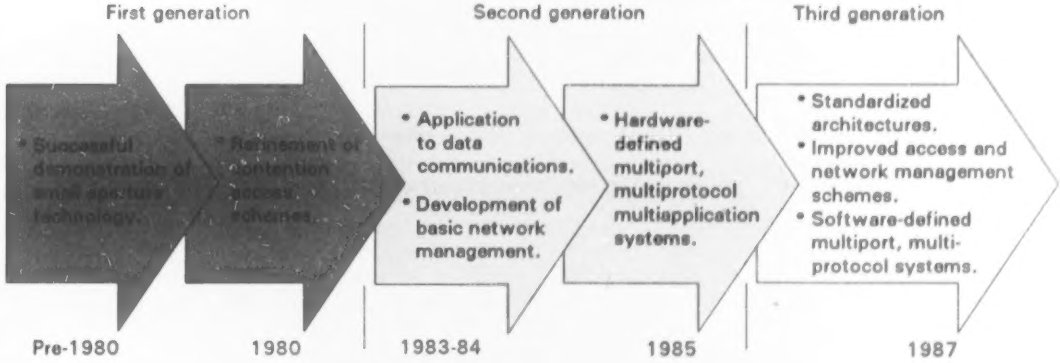
[64] Documents filed in FCC CC Docket #86-495 (BETRS) provide detailed information on this service.

Figure 3-1—Evolution of VSAT Technology


First generation
Second generation
Third generation
• Successful demonstration of small aperture technology.
• Refinement of contention access schemes.
• Application to data communications.
• Development of basic network management.
• Hardware-defined multiport, multiprotocol multiapplication systems.
• Standardized architectures.
• Improved access and network management schemes.
• Software-defined multiport, multi-protocol systems.
Pre-1980
1980
1983-84
1985
1987

The evolution of very small aperture terminal (VSAT) technology: three generations.

SOURCE: Art reproduced by permission of *Telecommunications* magazine.

45 megabits per second—are expected to be available in the early 1990s.[65]

Clearly the most advantageous feature of radio technology is its low cost in rural service applications. Unlike wireline service, its cost is based on total demand rather than on population density. Thus, whereas it can cost, on average, $10,000 per subscriber to provide access lines via copper wire, the average cost of digital radio is about $3,000 per subscriber. According to present estimates, rural radio service is now the most cost-effective option for serving about 900,000 remote subscribers who do not have service at all, or whose service upgrades using other technologies are not cost-effective.[66]

The idea of using satellite systems to provide low-cost communication services to isolated areas is not new.[67] In the United States, the Alascom Satellite operating through the Aurora satellite system has served to meet the communication, health, educational, and entertainment needs of the people of Alaska for two decades. In addition, over 25 developing countries have leased capacity on the INTELSAT satellite system to meet their domestic communication needs. A number of countries—including among them Brazil, India, Indonesia, and Mexico—have deployed their own satellite systems.

Advances in satellite technology will lead to even greater rural applications in the future. The development of very small aperture terminal (VSAT) technology has been particularly important in improving performance while reducing costs (see figure 3-1). The mobile satellites being designed now for launch in the early 1990s will carry sufficient power to enable the use of a large number of small, mobile terminals on the ground.[68] Portable units will be self-contained and lightweight, capable of fitting on a company or family car. They will allow users to link up with private networks or the public telephone network to access a variety of services, including voice, data, facsimile transmission, and computer-to-computer communications.

Many businesses are shifting from wireline to VSAT technology (see box 3-E). VSATs are particularly cost-effective when businesses need to communicate with remote sites. Thus many major corporations—e.g., Chrysler, Nissan, Toyota, K-Mart, Thrifty Stores, and Frito-Lay—are using VSATs to develop wide area networks (WANs). Hughes Network

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[65] George Calhoun, "Digital Radio Technology and Rural Economic Development," contractor report prepared for the Office of Technology Assessment, October 1989.

[66] Ibid.

[67] For a discussion, see Joseph Pelton, "Satellite Technology and Rural Economic Development," contractor report prepared for the Office of Technology Assessment, October 1989. See also, S.S. Kamal, "Advanced Telecommunications for Rural Applications," *Satellite Communications*, October 1989, pp. 21-23.

[68] See Tariq Kahn, " 'Third-Generation' Technology Fuels VSAT Growth," *Telecommunications*, September 1990, pp. 29-34.

Box 3-E—VSAT Technology

As the technology for very small aperture terminals (VSATs) develops and their costs decline, many companies are finding that VSAT networks are more advantageous than terrestrial networks for the transmission of large amounts of data between widely dispersed locations. A $200 million industry in 1988, markets for VSATs are expected to now exceed $1 billion. VSATs' "inherent performance advantages [include] fewer discrete points of failure, simpler network deployment, more flexible network configuration, and simplified network management." The technology is proving especially valuable to manufacturers and retailers, such as Chrysler, K-Mart, Thrifty Stores, and Frito-Lay, with many retail and plant facilities spread over large areas.

Smaller companies that cannot afford to install their own systems can take advantage of shared-hub networks. For example, Terra International, Inc., based in Sioux City, IA, recently chose a shared-hub VSAT network to connect its outlets spread throughout the country with its centralized computer center, which provides an array of business support applications. Terra, which manufactures and sells agricultural products, cites a reduction in communication costs in excess of 25 percent since VSAT was installed in 1989. Another benefit is increased reliability of the transmission of data. The VSAT network eliminates the need to deal with many phone companies, each with different pricing structures and technical capabilities.

SOURCES: "VSATs: Far-Out Communications for Remote Sites," *Telecommunications*, September 1990, p. 37. Tariq Khan, " 'Third-Generation' Technology Fuels VSAT Growth," *Telecommunications*, September 1990, p. 29.

Systems is planning to provide leased WAN service to businesses from a shared hub facility.[69]

Switching and Other Networking Technologies

The value of information and communication technologies is greatly enhanced to the extent that they can be networked together, allowing information to be efficiently routed from place to place. A number of technologies support networking by performing interconnection, switching, routing, and signaling functions. Included among these, for example, are switches,[70] bridges and routers,[71] local area networks (LANs), signaling systems,[72] and intelligent peripherals.

Network technologies have advanced greatly over the past several years as a result of digital processing. The first computer-controlled switching systems were deployed 20 years ago. In the 1970s, when advances in integrated-circuit technology permitted the creation of a solidstate exchange, telecommunications providers began to deploy all digital switches. Today, approximately 98 percent of all AT&T switches are digital.[73] With respect to the regional Bell operating companies (RBOCs), approximately 55 percent of Ameritech's central offices are digital, 66 percent of Bell Atlantic's, 62 percent of Bell South's, 47 percent of Nynex's, 43 percent of Pacific Telesis', 27 percent of Southwestern Bell's, and 32 percent of US West's.[74] For the RBOCs' projected deployment of SSI and ISDN see figure 3-2.

With the deployment of even more powerful microprocessors, faster computing speeds, and larger memories, it is possible to locate intelligence not just in the central office switch, but also at nodes throughout the network. Because these "intelligent" nodes can communicate in real time with one

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[69] Paul J. Nicholson, "The Hughes Network Systems Shared Hub Facility at Spring Creek, NY," *Telecommunications*, September 1990, pp. 69-70.

[70] A switch can be defined as "means of allocating resources—space, bandwidth, or time—to people or machines that use the resource to communicate at a distance." As quoted in Ivan T. Frisch, "Local Area Networks versus Private Branch Exchanges," *Telecommunications*, November 1988, p. 24.

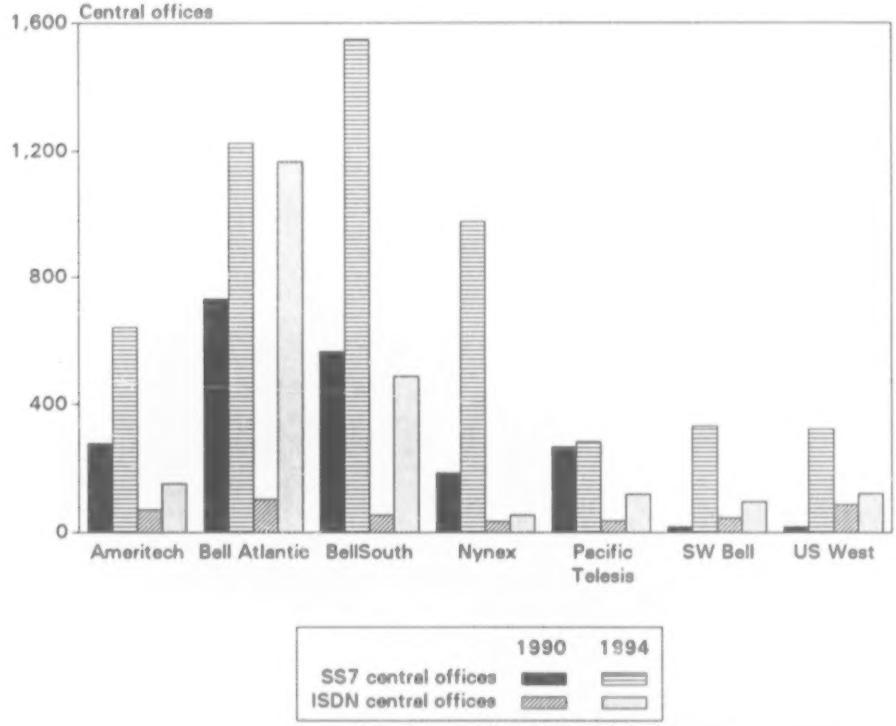
[71] Bridges and routers are devices to interconnect networks. See for a discussion, William Stallings, "Internetworking: A Guide for the Perplexed," *Telecommunications*, September 1989, pp. 25-30.

[72] Signaling systems perform supervisory functions, adressing functions, as well as information support functions. In previous systems, signaling information was passed together on the same channel as a message (called in-band signaling). This method was less efficient. It used up capacity and precluded the modification of calls, once in progress. However, with Signaling System 7, it is now possible to provide out-of-band signaling, which allows for a much more flexible and intelligent network. Abdi R. Modarressi and Ronald A. Skoob, "Signaling System No. 7: A Tutorial," *IEEE Communications Magazine*, July 1990, pp. 19-35.

[73] Ian M. Ross, Keynote Address for Publication in the Conference Proceedings of the 1988 Bicentennial Engineering Conference, Sydney, Australia, Feb. 23, 1988, p. 12.

[74] According to the companies' filings with the FCC in late 1989 for rate-of-return reproscription. Personal communication with Stan Williams, Bellcore, Feb. 13, 1981.

Figure 3-2—Regional Bell Operating Companies' Central Offices: Present and Projected



SOURCE: Carol Wilson and Czatdana Inan, "LECs Flatten Spending, Feast on Fiber," *Telephony*, vol. 219, No. 26, Dec. 17, 1990, p. 42.

another, as well as with other networks, communication based on this kind of architecture offers greatly enhanced flexibility—they can respond quickly to network problems and to changes in user demand, optimize network capacity, and ensure greater system and service reliability.[75]

Fast packet-switching is an important development in this regard, and it will provide the basis for shared networking. Like conventional packet-switching, fast packet-switching makes optimal use of a transmission channel, but it does so with even greater speed and flexibility. Whereas conventional packet-switching is suitable for data only, fast packet technology can be used to switch voice, data, and images in an integrated fashion. Also, fast packet-switching can transmit hundreds of thousands or millions of packets per second, while conventional ones operate at a rate of only a few thousand packets per second (see figure 3-3).[76]

This dispersal of intelligence throughout communication systems is well illustrated in the intelligent network.[77] Using intelligent switches and databases,

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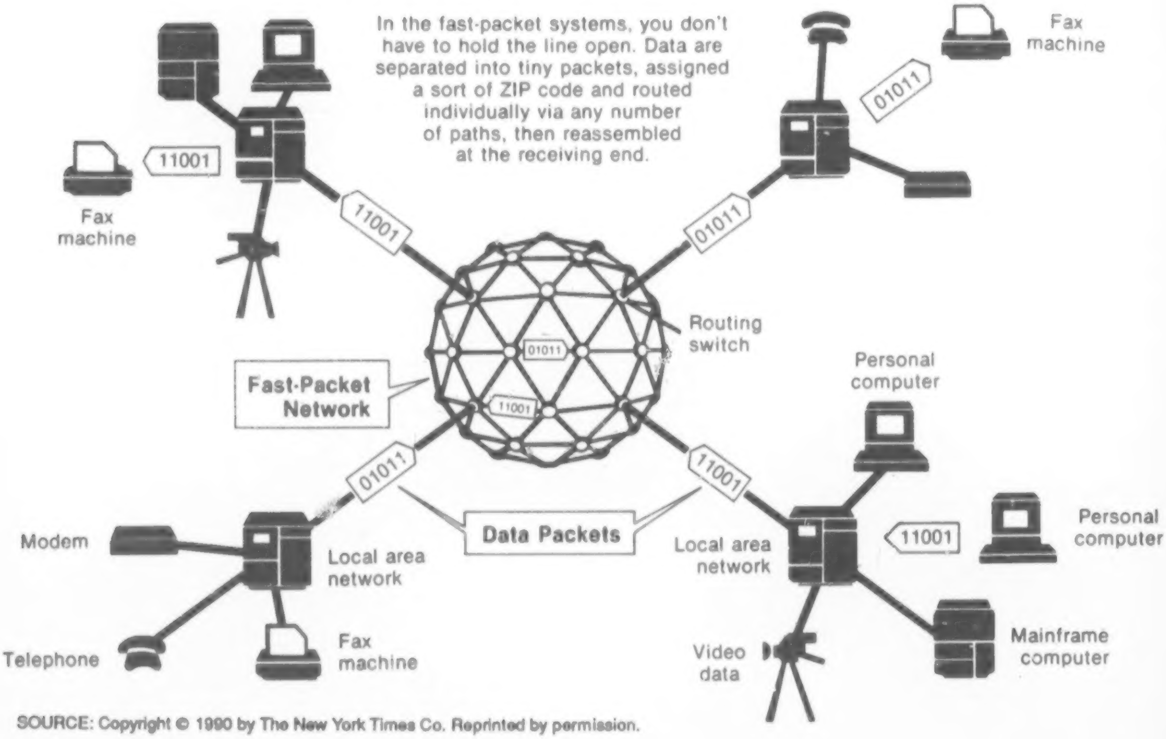
[75] See, John O. Boese and Richard B. Robock, "Service Control Point: The Brains Behind the Intelligent Network," *Bellcore Exchange*, November/December 1987, p. 13.

[76] See for discussions, David P. Helfrich, "Fast Packet Switching: An Overview," *Telecommunications*, Novemeber 1988, p. 68; and James Brackett, "Fast Packet Switching: A Tutorial," *Telecommunications*, November 1988, pp. 65, 67-68, 70-72, and 76.

[77] The idea of developing an intelligent network is not new. It was first conceived by AT&T before divestiture as a means of providing nationwide database services and private virtual networks. Since divestiture, both AT&T and Bell Communications Research (Bellcore), with the cooperation of other vendors, have been conducting research and development in this area. However, the development of the intelligent network has been much slower than was originally anticipated. Initially, Bellcore planned to develop the intelligent network in stages—Intelligent Network/1 (N/1), which was intended for completion in 1991 and the Intelligent Network/2 (N/2), which was cast as the network of the 1990s. Designed to be even more flexible than N/1, N/2 would allow services to be provided in a variety of physical network configurations under the control of many different entities. In January 1989, however, Bellcore adopted a revised, more staggered approach, and postponed the development of the Advanced Intelligent Network (equivalent to an enhanced version of N/1, often referred to as N/1+) until 1995, a delay of 4 years. See for a discussion, Robert Preston, "Bells 'Intelligent Network' Could Be Delayed Until 1995," *Communications Week*, Feb. 20, 1989.

Figure 3-3—Fast-Packet Switching (Hello Central)



In the fast-packet systems, you don't have to hold the line open. Data are separated into tiny packets, assigned a sort of ZIP code and routed individually via any number of paths, then reassembled at the receiving end.

SOURCE: Copyright © 1990 by The New York Times Co. Reprinted by permission.

together with common channel signaling, the intelligent network allows network control functions to be separated from network switching functions.[78] This capability permits the network to select the most appropriate services and optimal routes, and to introduce new value-added services via simplified and modularized software. Among the services that the intelligent network can provide are dynamic call routing, call forwarding, call queuing, credit card billing, reverse charging, control of calls based on data held in a central database, wide area Centrex, and virtual private networks.[79] A description of the basic components comprising the intelligent network, and a discussion of how they are joined to provide intelligent services, is provided in box 3-F.

Intelligent networking technologies are also being used to create a wide variety of special purpose communication networks. In the past, one telecommunication network existed to provide universal service to all users. This arrangement was quite suitable, as users' needs were very similar and the services that could be offered were relatively limited. Businesses, for example, used the telephone for voice communication in much the same way as households did.

Today, this is no longer the case.[80] For many businesses, transmitting data now represents a more significant cost item than transmitting voice, and their data traffic is growing at a rate of 40 percent or

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[78] See for discussions, David G. Fisher and William Bauer, "Multiplexing With Intelligence," *Telecommunications*, February 1988, pp. 73-74 and 79; see also Marcel E. Looson, "The State of the Intelligent Network Art," *Telecommunications*, February 1988, pp. 47, 52, and 57.

[79] Gilhooly, op. cit., footnote 37, p. C5.

[80] As Eli Noam has pointed out: "The emergence of technological and operational alternatives undercut the economies of scale and scope once offered by the centralized network. In the past, sharing a standardized solution was more acceptable to users because the consequential loss of choice was limited and outweighed by the benefits of the economies of scale gained. As the significance of telecommunications grew, however, the costs of nonoptimal standardized solutions began to outweigh the benefits of economies of scale, providing the incentive for nonpublic solutions. Furthermore, some users began to employ a differentiation of telecommunication services as a business strategy to provide an advantage in their customer's eye. Therefore they affirmatively sought a customized rather than a general communication solution." Eli M. Noam, "The Future of the Public Network: From the Star to the Matrix," *Telecommunications*, March 1988, pp. 58-59, 65, and 90.

Box 3-F—The Intelligent Network

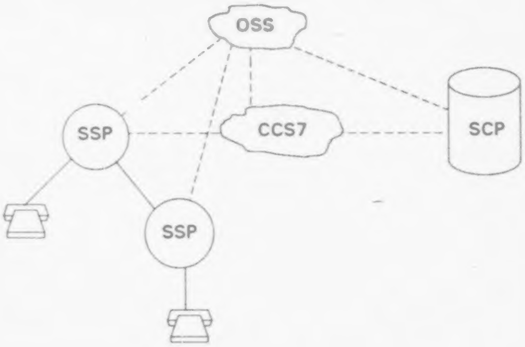
The intelligent network is comprised of four basic elements. These include:

- a *Service Control Point* (SCP), which consists of a centralized database that uses algorithms and customer instructions to route messages;
- a *Common Channel Signaling System* (CCS7) that provides out-of-band, packet-switched communications among network elements;
- a *Service Switching Point* (SSP) that consists of local and tandem-switching nodes designed to carry out low-level, high-volume functions such as dial tone, announcements, and routing. The SSP performs functions as directed by the SCP; and
- an *Operations Support System* (OSS) that provides for network planning, engineering, provisioning, monitoring, maintenance, and repair.

How these elements relate to one another to provide service can be seen in the figure below.

To envision how this network operates, consider what happens with an 800 call. When an 800 number call is generated, it is sent to the SSP, which identifies its as an 800 call. At this point, the SSP sends the number, together with other information about the calling party, to the SCP via the CCS7 signaling network and asks for further instructions about how to treat the call. The SCP searches its database, translates the received 800 number into a standard telephone number, and returns this telephone number together with a routing instruction to the SSP, which then routes the call to its correct destination.

SOURCE: Paul Bloom and Patrick Miller, "Intelligent Network/2," *Telecommunications*, June 1987, p. 58.



SSP: Service Switching Point
CCS7: Common-Channel Signalling No. 7
SCP: Service Control Point
OSS: Operations-Support Systems

SOURCE: Art reproduced by permission of *Telecommunications* magazine.

more. In addition, different kinds of businesses increasingly have different kinds of business needs. Thus, businesses have been quick to take advantage of the unbundling of the communication infrastructure and the availability of a wide range of new, advanced products to develop their own customized communication systems. Banks and other financial institutions have developed specialized communication services such as the Society for Worldwide Interband Financial Telecommunications (SWIFT), while manufacturers have developed their own communication protocols, such as manufacturing automation protocol (MAP). Even system integrators are beginning to differentiate themselves by providing specialized networking services.[81]

Specialized networking has also proliferated within the scientific community. The first computer-based message system, ARPANET, was set up in 1968 in the Department of Defense by the Defense Advanced Research Project (DARPA) to provide communication between computer terminals and host computers (see figure 3-4).[82] Today, members of the education and scientific communities are pressing for the development of a more advanced communication network—the National Research Education Network (NREN). Designed to link supercomputer centers, this network would operate at very high speeds, in the gigabit range.[83]

This kind of networking offers a number of benefits. At a minimum it can provide electronic

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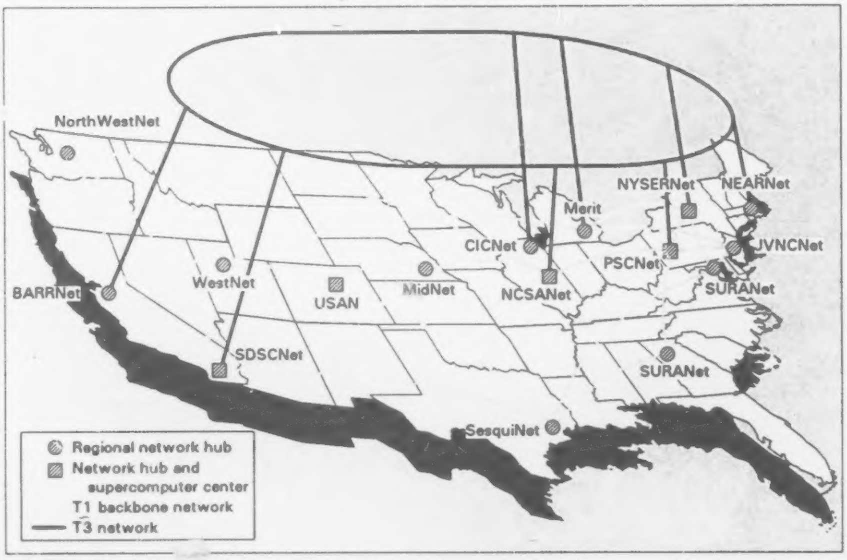
[81] Kelly Jackson, "The Diversification of System Integration," *Communication Week*, Aug. 28, 1989, pp. 22-24.

[82] Building on the packet-switched network technology developed by DARPA, other agencies developed specialized networks for their research communities (ESNET, CSNET, and NSFNET). Meanwhile, other research-oriented networks, such as BITNET and USENET, were developed in parallel by academic and industry users who, not being grantees or contractors of Federal agencies, were not served by the agency-sponsored network. John S. Quarterman, *The Matrix: Computer Networks And Conferencing Systems Worldwide* (Bedford, MA: Digital Press, 1990).

[83] For a discussion of the public policy issues raised by NREN, see OTA forthcoming study, "Networking the Nation: The National Research and Education Network," expected publication date, summer 1991.

Figure 3-4—NSFNET



NSFNET is the National Science Foundation's high-speed network to connect mid-level regional computer networks that support scientific research facilities throughout the country. By the end of 1991, all of the backbone sites will be connected to the T3 network.

SOURCE: Merit Network, Inc.

mail and news services. Networks can also provide remote processing, allowing any computer in the network to access computer programs stored on any other host. Network users can also gain remote access to supercomputers to do advanced graphics, chip design (and remote fabrication), and scientific or economic computer simulation, and can access remote databases. In addition, they can use the network to collaborate with others or to participate in computer and/or video conferences. Perhaps the most important attribute of networks is that they can sort out people with similar interests and bring them together. Like the telephone and unlike the telegraph, they tend to reinforce community ties.

Local area networks (LANs), wide area networks (WANs), and—more recently—metropolitan area networks (MANs) are the building blocks of communication networks. LANs are relatively limited in their reach. They generally cover the premises of a building or a campus. Within the business community, the number of LANs deployed has recently grown by leaps and bounds. Predictions are that, in 1992, the number of LANs shipped will reach 5,228,945, and more than half of all PCs will be connected by LANs.

WANs provide long-haul connectivity among separate networks located in different geographic areas. Many businesses are using WANs to extend and restructure their operations on a national or worldwide basis, while at the same time gaining the economies of scale and scope that can be achieved by large-scale, shared networks.

WANs make use of a wide variety of transmission media, which can be provided on a leased or dial-up basis. WANs can also be privately owned. Recently, many businesses have chosen satellite networks, taking advantage of the development of relatively low-cost small aperture terminals to link their various offices to their headquarters facilities. General Motors is planning to build the largest network of this kind. Scheduled for operation in 1992, it will consist of 9,700 very small aperture terminals (VSATs) that will connect GM locations nationwide.

Still in the field testing stage, MANs provide switched data networking services at very high speeds (40 to 50 megabits per second) within a geographic area of at least 50 miles. MANs connect LANs to LANs as well as LANs to WANs. As designed by Bellcore, MANs will provide switched multimegabit data services (SMDS), which will allow users to set up a virtual (or logical) private network, and give them access to individual services on demand. These networks are optimally designed for shared usage (see figure 3-5).

To take advantage of advances in networking, rural areas will—at the very least—need digital switches.[84] Unlike loop technologies, the cost of switching facilities is shared, so digital switching is likely to be available in rural areas long before fiber technology. According to one estimate, the total cost of upgrading rural subscribers to digital central office switches is about $2.5 billion, or $250 per subscriber.[85] This is not beyond the financing capability of the average rural telephone company, even at existing subscriber rate levels. Current REA company total annual cash flow is over $1 billion, and construction spending is also estimated at about $1 billion.[86]

Figure 3-6 gives switching plant characteristics for REA companies. Interestingly, REA companies—while serving proportionately more of their subscribers with old step-by-step mechanical switching technologies—have a higher proportion of lines served with advanced digital technology (45 percent) compared to Bell companies (30 percent) and the 10 largest independents (61 percent). This has important implications for network upgrade decisions. On average, Step-by-Step switches are much older than the stored program control 1AESS and cross-bar electromechanical switches that serve many Bell access lines and therefore closer to economic retirement. Thus, small companies may have an advantage over large telephone companies who must consider the financial effects of early retirements of their embedded base of electromechanical analog and electromechanical switching plant.

The per-subscriber costs of digital switching are also likely to fall as the technology advances and is used more efficiently. For example, the development of remote digital switching modules (called Transfer Switching Points in the context of the Intelligent Network Architecture) now permits carriers to use fewer expensive host switches to provide advanced intelligent services such as access to 800 number databases. The cost savings can be substantial. One host switch, such as the AT&T 5ESS, costs approximately $510 million, whereas a remote switching module will cost between $600,000 to $700,000.

Implications and Opportunities for Rural Areas

Technology Requirements and the Pace of Technology Deployment

In an information-based economy, communication needs are relative. In evaluating a rural community's technological requirements, therefore, it is necessary to look not only at a community's own economic activities, but also at its economic aspirations and, increasingly, at the activities of its competitors, whether they be businesses in urban areas or in other countries.

Rural areas will be unable to compete if the pace of technology deployment lags greatly behind that in other areas. All indicators suggest, however, that this will be the case. The history of the telephone, for one, points to such an outcome: first came major trunks linking Northeastern cities, followed by lines to smaller towns in their immediate hinterlands, then connections to major Midwestern cities, and so forth—a sequence of connecting ever lower order cities. Thus, although patented in 1876, it took 12 years for the telephone to reach Chicago, and transcontinental service was not inaugurated until

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[84] Digital switches can provide users with an array of call-management capabilities including call waiting, call forwarding, and three-way calling, as well as newer services including caller identification, call trace, distinctive ring, call block, call return, and preferred call forwarding. Analog switches can be upgraded to perform some, but not all, of the call management functions that are possible with digital switches.

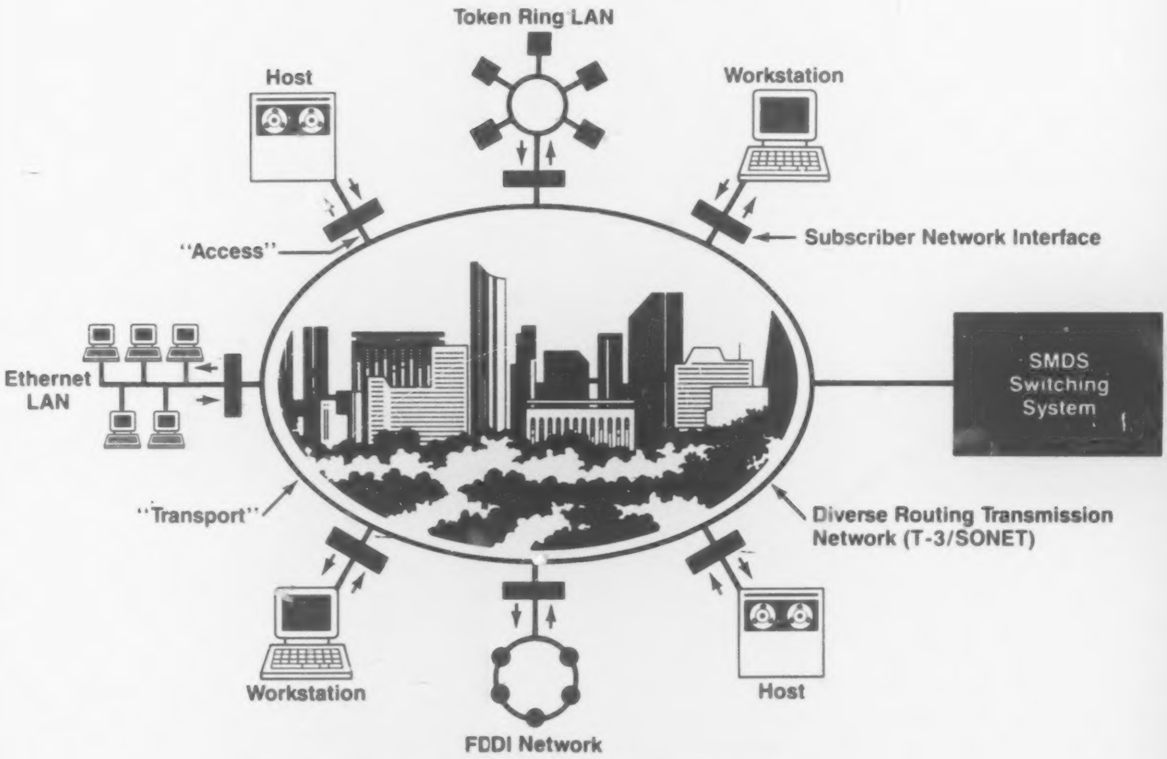
It should be noted that both analog and digital switches can provide touch-tone service. Touch-tone service enables the caller to conduct telephone transactions with automated answering systems. These transactions range from banking to placing calls with a calling card, to obtaining prerecorded tax information from the Internal Revenue Service.

[85] Egan, op. cit., footnote 28. This estimate assumes 20 million rural subscribers with half already served by digital central office switches. A recent study of switching upgrade costs for rural loops for U.S. West estimated average per subscriber digital upgrades at $300 to $500 per subscriber in one State and $180 in another. This report also suggests that a reasonable near-term target is as low as $150 per subscriber. See Julio Molina and E. Reed Turnquist, "Rural Network Modernization in U.S. West," draft, July 25 1989.

[86] Egan, op. cit., footnote 28, pp. 40-41.

Figure 3-5—LANs and MANs

Future Metropolitan SMDS Network



Transmission speeds are scheduled to increase in the future. Access speeds to SMDS are planned to be T-1 (1.544 Mbps) through T-3 (45 Mbps). Transport (on the ring) is planned to go from T-3 to the ultrafast Synchronous Optical Network (SONET) speeds (150 Mbps — 600 Mbps).

SOURCE: Courtesy of Southwestern Bell Telephone.

1915.[87] As a result, favorably situated businesses in the Northeast enjoyed a headstart of several decades in utilizing regional and interregional telephony.[88]

With deregulation and a highly competitive industry environment, it is unlikely that the deployment of new, information-age technologies will deviate greatly from this earlier pattern. One recent analysis suggests that, assuming a cost of $1,000 per subscriber, narrowband digital service can be delivered to rural areas within a 10- to 20-year timeframe. Broadband capabilities could be delivered to business subscribers within 2 to 10 years, at a cost of $5,000 per subscriber. It would take 10 to 20 years for residential users to receive broadband services, assuming the same per-subscriber costs.[89]

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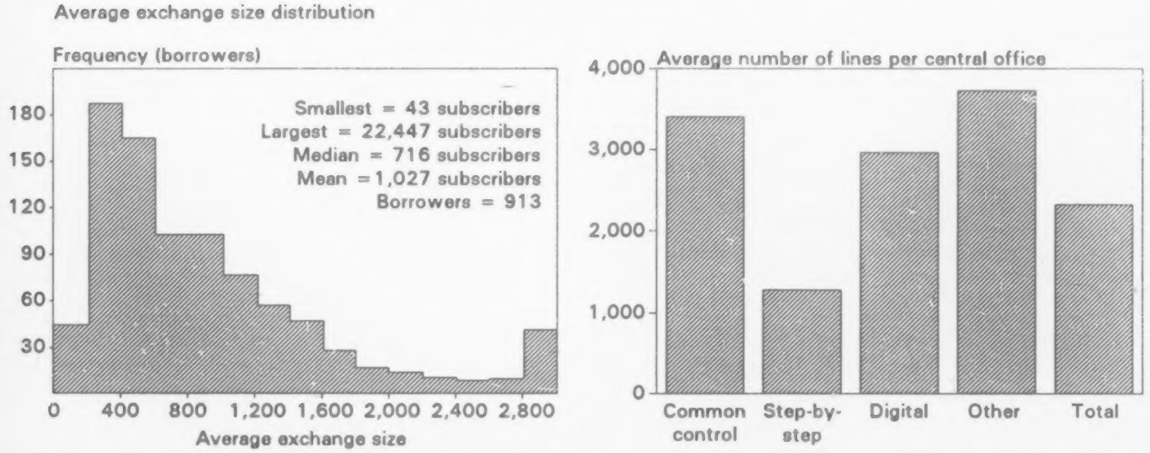
[87] Kielbowicz, op. cit., footnote 2. Of course, many communities outside the Northeast developed their own local and regional systems, but for the most part they were not effectively integrated into the larger network.

[88] In the case of the telegraph, it took 17 years to link both coasts. Richard DuBoff describes the problems of the small town user: "In concrete terms, telegraph users in smaller towns often found that the lines were tied up by heavy volumes of messages traveling between and within major cities. . . In 1848, an important business reply sent from Troy, New York, to Rochester took more than 24 hours to be transmitted to Rochester, 'solely because the [Troy] operator could not get his turn at the wires.'. . Incidents like this one appear to have been common, and they persisted into the era of improved instrument technology after 1870." DuBoff, op. cit., footnote 5, pp. 269-270.

[89] Egan, op. cit., footnote 28.

Figure 3-6—REA Central Office Switching Characteristics



The figure on the left shows the distribution of the exchange sizes of the 900 independent telephone companies that borrow from REA. Nearly one-third of these providers operates small exchanges, serving between 200 and 600 subscribers. The figure on the right shows the average number of lines that each type of central office supports for the REA borrowers.

SOURCE: Rural Electrification Administration.

There is considerable disagreement as to whether such a deployment schedule can meet the needs of rural areas. For example, many regulators and vendors do not view rural needs in relative terms. Instead, they look at needs in the present, evaluating them on an individual user, service-by-service basis. Accordingly, they contend that the needs of most rural businesses can be met given the evolutionary deployment of technology. From their point of view, efforts to modernize the infrastructure should focus on immediate problems such as assuring that all parties have access to single-party lines, digital switching facilities, and touch-tone dialing.

There are others, however, who believe this assessment to be overly conservative. Citing the growing capacity requirements needed to support functions such as office automation with multifunction workstations, computer/aided design/computer aided manufacturing (CAD/CAM), and high-speed distributed data processing, they predict that rural businesses, if they are to be competitive, will need broadband capabilities within a much shorter timeframe.

This debate is not likely to be easily resolved. At present, there is not even a consensus about what capabilities large business users will need, and within what timeframe.[90] Trade-offs can be made between software capabilities and transmission capabilities. For example, with advances in compression technology less transmission capacity will be required. However, if new applications multiply faster than the advances in compression technologies (as might be the case, for example, with supercomputing and multimedia technologies) bandwidth requirements will be greater. Past estimates of future needs have been overly conservative, and vendors have been slow to anticipate future demand. Up until now at least, users have generally found ways to make full use of the bandwidth available to them.[91]

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[90] For a discussion of the debate about broadband, see Martin C.J. Elton, "Integrated Broadband Networks: Balancing the Risks," Columbia University, Center for Telecommunications, 1989.

[91] As industry observer Tom Valovic has noted, "Current applications should not be used as a yardstick for future bandwidth requirements. Otherwise, it's another variation of the 'chicken/egg' question: the transmission people won't build the capacity unless the applications are there to justify them, and the applications people won't develop new ones because the transmission capacity isn't available. The real truth of the so-called bandwidth argument lies in something called Deboever's Axiom: 'Data will expand to fill the bandwidth available'." Tom Valovic, "T1, T3, and the Never-Ending Bandwidth Argument," *Telecommunications*, December 1988, p. 6.

New Ways of Configuring Rural Networks

Together, the trends towards unbundling and decentralized intelligence will allow rural communities to have greater choice about, and control over, the configuration of their communication infrastructure. This is an important advantage since communication technologies define communities.[92] By multiplying and intensifying contacts among people, some communication technologies tend to reinforce local, geographically based communities while others do not.[93]

Having more choice and control over their communication infrastructures is even more important as rural communities seek to use technology to compete more effectively with urban areas for businesses and jobs. It is not enough to improve the overall performance/cost ratio of communication technologies. Since it takes longer to deploy technology in rural than in urban areas, technological advances that affect everyone equally are likely to make rural areas worse off. What rural areas need to actually improve their situations are technologies or technical capabilities that can reduce the urban advantage. Thus, they will need to think about their communication systems less in terms of urban models and more with reference to the specific set of conditions found in rural areas.

One way of reducing the urban advantage is to deploy technologies, such as digital radio and satellite, where costs are relatively insensitive to distance. Another is to finding new ways to achieve economies of scale and scope. The trends towards the convergence of media and developments in networking provide rural communities a number of new opportunities in this regard.

The convergence of communication functions, media, and products and services will permit communication providers to spread their costs more widely, and thus to reduce the price that users must pay for service. With the deployment of advanced digital switches and fiber optics, for example, communication providers will be able to integrate services, transmitting two-way voice, data, and video on a joint basis. This prospect has particular relevance in rural areas, where the cost of providing any one of these services alone can be prohibitive.[94]

New economies can also be generated through networking. As noted above, networking allows like-minded people not only to communicate with one another, but also to share common resources. In so doing, they can benefit from significant economies of scale and scope. This kind of networking could be especially fruitful in rural settings, where people and facilities are few and far between.

Just as businesses are taking advantages of these developments to create their own customized networks, so too might rural communities. However, whereas many business networks are established along functional lines, Rural Area Networks (RANs) would be configured, instead, around the geographic boundaries and needs of an entire community. Designed on the basis of a ring, or campus type, architecture, a RAN would link up as many users within a community as possible—including among them businesses, educational institutions, health providers, and local government offices (see figure 3-7). Rural Area Networks could be linked statewide, perhaps by piggybacking on the State government and/or the State educational network.

Rural Area Networks have a number of advantages:

- RANs would foster the deployment of advanced technology to rural areas in an economically viable manner. By pooling diverse users, they would provide considerable economies of scale and scope.
- Built to meet shared needs, they could foster cooperation and community ties.

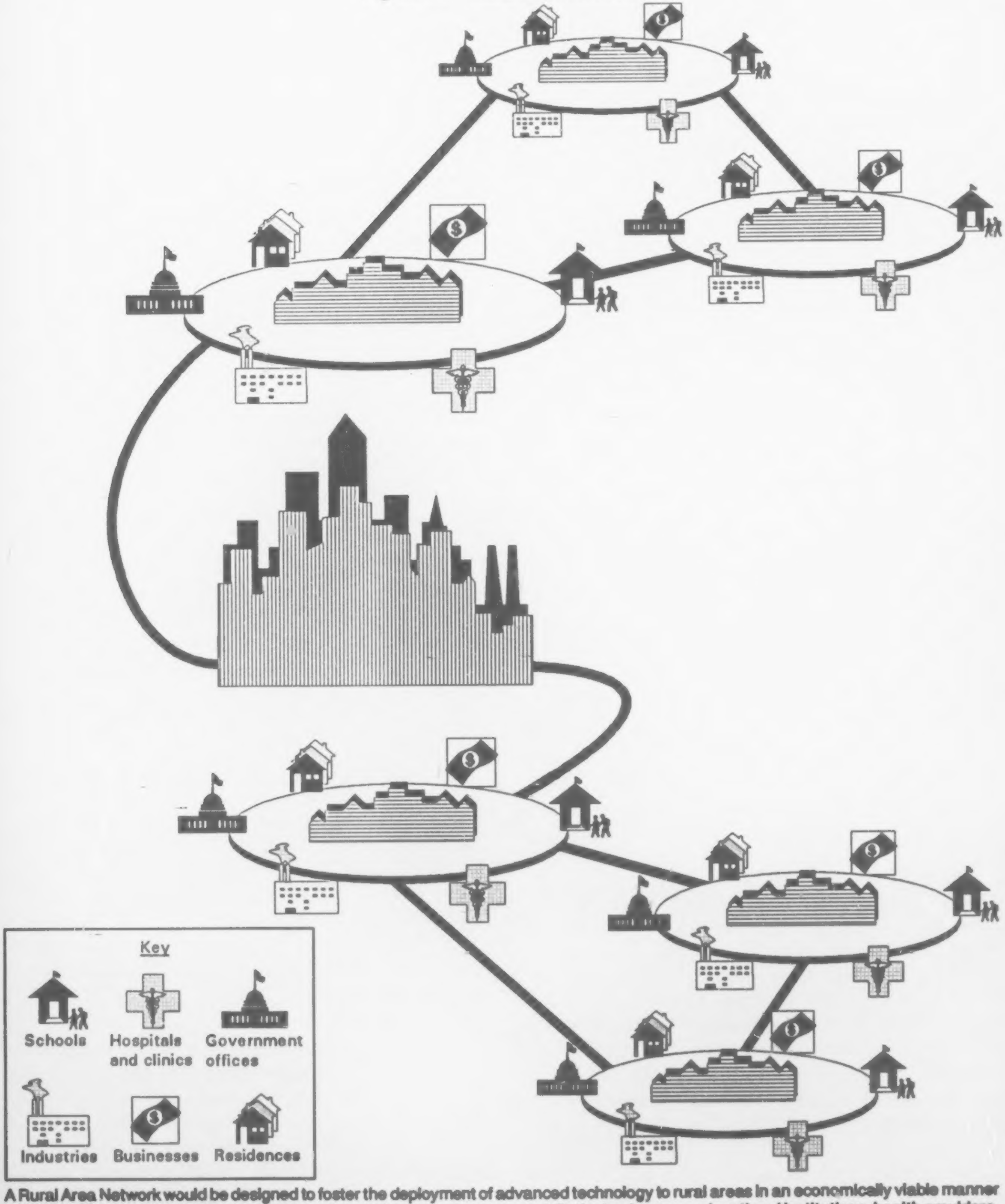
---

[92] As John Dewey has pointed out, communities are defined and reinforced by their communication systems. According to Dewey, "Society not only continues to exist by transmission, but it may fairly be said to exist in communication. There is more than a verbal tie between the words common, community, and communication. Men live in a community by virtue of the things they have in common; and communication is the way in which they come to possess things in common." John Dewey, *Democracy and Education* (New York, NY: Macmillan Co., 1915).

[93] For a discussion, see Kielbowicz, op. cit., footnote 2.

[94] Present rules and regulations limit the extent to which carriers and service providers can take advantage of this opportunity. To prevent regulated telephone companies from engaging in an anticompetitive behavior, the Modified Final Judgment, which gave rise to divestiture and the break up of the Bell System, forbids them from providing ". . .any product or service that is not a natural monopoly service actually regulated by tariff." State regulations, which preclude intraLATA competition, also serve to constrain the extent to which communication providers can take advantage of new technologies to create additional economies of scale and scope. These regulatory issues are discussed in some detail below, in ch. 5.

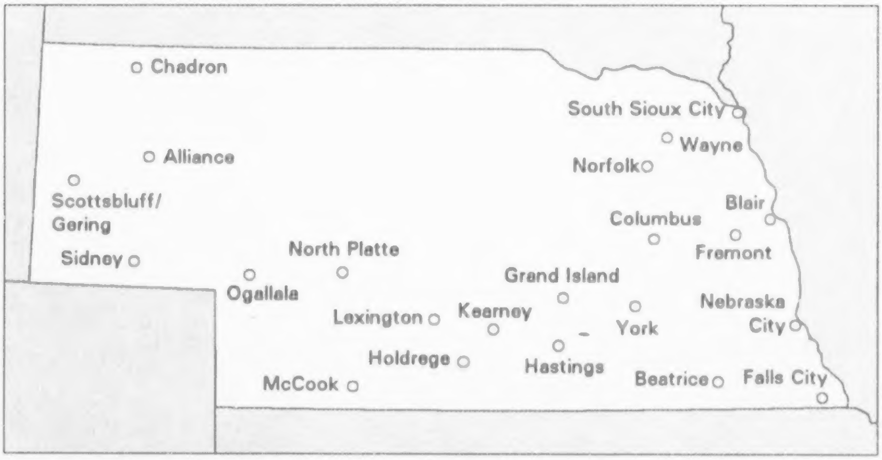
Figure 3-7—Rural Area Networks


Key
Schools
Hospitals and clinics
Government offices
Industries
Businesses
Residences

A Rural Area Network would be designed to foster the deployment of advanced technology to rural areas in an economically viable manner by pooling the communication needs of a community's many users—especially the businesses, educational institutions, health providers, and local government offices.

SOURCE: Office of Technology Assessment, 1991.

Figure 3-8—Nucleus City for Nebraska



It will be economically infeasible for many rural communities to keep pace with the modernization of telecommunications, and as a consequence many rural citizens will be further disadvantaged in securing fundamental services such as health and education. It will therefore be necessary to identify ways to give rural people and businesses access to these critical information highways and the services they will support and deliver. According to this model of nucleus townships, small rural communities will be most effectively served by concentrating on upgrading the telecommunications services of certain towns and small cities that will "function as hubs for the surrounding communities."

SOURCE: Sufi Nazem, University of Nebraska, "Telecommunications and Economic Development in Rural America: A Case for Nebraska," contractor report prepared for the Office of Technology Assessment, December 1990.

- RANs would overcome the limitations of technological expertise in rural areas since they could be designed by one systems integrator.
- RANs would induce communication providers to be more responsive to the communication needs of rural communities. By joining forces, rural users will be able to exert greater leverage in the marketplace.

The ways of configuring rural networks are as diverse as rural America itself. Experimentation is in order. Sufi Nazem, for example, proposed the idea of creating nucleus cities, or hubs, throughout the State of Nebraska, each of which could serve communities within a 30- to 40-mile radius (see figure 3-8). As he points out, while "it is inconceivable that all small communities in Nebraska could be connected by the costly network any time soon, it is not . . . inconceivable to install a high technology network for approximately twenty-two townships."[95]

The Maine Research and Productivity Center, in Presque Isle, already serves as such a hub for small businesses in the surrounding area.[96] Among the services that the Center provides are access to comprehensive information services as well as a shared CAD/CAM system. According to William Forbes, the Center's Executive Director, some small business owners and operators travel 50 miles to use the jointly owned CAD/CAM system, which would be much too costly to purchase on an individual basis. Because the Center is linked by a fiber network to the Canadian research facility in Fredericton, New Brunswick, it can also provide local businesses access to the services of this prestigious, multimillion-dollar institution.

Bloomsburg, a business center in rural Pennsylvania, has also taken a proactive role in assuring that its communication infrastructure can meet present-day business needs. Reassessing its communication infrastructure in the light of its changing economy, the town concluded that "Bloomsburg is in the position of being a telecommunication 'island' without an effective bridge to the outside."[97] Although businesses and institutions within Bloomsburg can obtain services such as local loop T1 circuits for high-speed data, voice, and compressed video applications, the town concluded that "connections between Bloomsburg and the rest of the world are not economical." To address this problem, it developed—together with the Ben Franklin Partnership and Bloomsburg University—a plan to construct and operate a high-capacity, digital "highway" to Harrisburg, the location of access points to all long distance telecommunication providers. This will be a 45 megabit per second digital microwave link with the capability of providing a broad range of telecommunication transmission services such as high-speed data, high-resolution graphics, compressed motion video, etc. Operated as a private carrier, it will resell capacity to users within Bloomsburg, providing them with gateway access for voice, video, and data communication services. The total cost of implementing the network including design and licensing, network construction, local infrastructure enhancements, and project administration) is estimated at $800,000. The town considers this price to be modest when weighed against the potential long-term economic benefits. Once in place, the network would provide a broad range of public as well as private communication services. For example, some capacity will be used to provide a two-way digital video and data link between Bloomsburg University and the Harrisburg University Center.

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[95] Sufi M. Nazem, "Telecommunications Policy and Rural Economic Development," University of Nebraska at Omaha, International Center for Telecommunications Management, n.d.

[96] The Maine Research and Productivity Center is a nonprofit corporation located on the campus of the University of Maine at Presque Isle. Separate from the University system, it is funded primarily by the Maine Science and Technology Commission. Its primary task is to provide technical assistance to Maine industry on a fee basis.

Creatively sharing communication and information systems and services can, of course, also be done in a smaller community, or on a much more modest scale. In many small rural Scandinavian towns, for example, a number of telecottages have been established to help local residents prepare for, and access the benefits of, the information age. Among the kind of services provided are:

- information services,
- data-processing services,
- information technology consultancy,
- distance working facilities,
- training and Education,
- telecommunication facilities, and
- village Hall facilities.[98]

In some locales, these telecottages—although they were originally set up using outside funds—operate on a self-sustaining basis. In other places and communities, they continue to be subsidized.

Where an adequate communication infrastructure already exists, it is sometimes possible to piggyback new services on it at very little cost. For example, when two professors at the University of Kentucky, Louisville, wanted to link the small private colleges in the Appalachian region of Kentucky up to the nationwide university research network, BITNET, an agreement was reached allowing these two faculty members to transmit BITNET via a portion of the television network's vertical blanking intervals. The costs to the university were minimal[99] (see figure 3-9—for other sharing schemes).

Changing User Requirements

While the unbundling of communication technologies and services now permits rural businesses and communities to design and deploy communication systems to meet their own particular situations and needs, it also places on them the burden of doing so. These are by no means easy tasks. Nor does the average rural businessperson have the requisite experience, skills, and resources to successfully undertake them.

Under the old Bell System, few were required, or even inclined, to explore their service options. Thus, today, many are unprepared to sort out the myriad of options available to them in an industry environment driven by rapid technological change. Taking the time out from routine business operations to come to terms with information age technologies is also difficult. Most rural businesses are quite small: job responsibilities are not specialized enough so that any one person could devote much time to becoming a communication expert. As one rural businessman reported to the OTA project staff:

> . . . I run my business on a shoestring. I supervise operations; keep the books; and even sweep the

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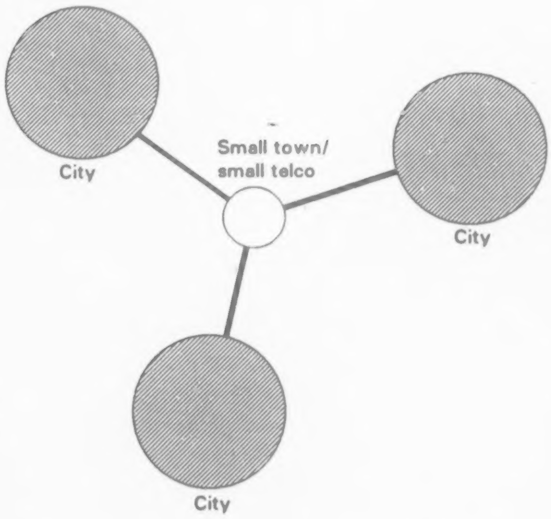
[97] See Dovetail Systems Corp., "Telecommunications Opportunities for Bloomsburg," June 15, 1989.

[98] Lars Qvortrup, "The Nordic Telecottages: Community Teleservice Centers for Rural Regions," *Telecommunications Policy*, March 1989, pp. 59-68. See also, H. Albrechtsem, "The Telecottages in the Nordic Countries," *Telecommunications Journal*, vol. 55, pp. 298.

[99] Conversations with Professors Ken Kubota and Paul Eakin, Department of Computer Science, University of Kentucky.

Figure 3-9—Sharing Schemes

Centrality Strategy



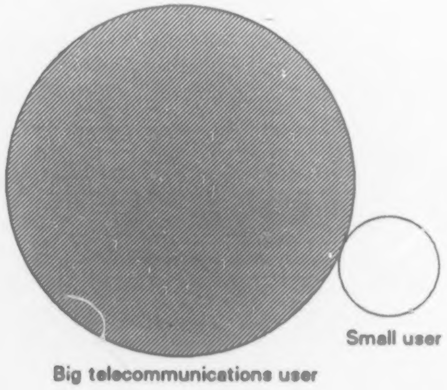
Centrality Strategy

ENMR Telephone Cooperative is an excellent example of how rural areas can capitalize on the flow of telecommunications between metropolitan areas by acting as a switching point.

Though serving a remote and sparsely populated region of eastern New Mexico, ENMR benefits from its location between major metropolitan areas. As an important switching point between these cities, ENMR is able to attain advanced technologies for its customers, such as Signaling System 7 capabilities.

According to ENMR's General Manager, the company's technological sophistication "has been aided by the fact that our cooperative serves as a 'golden highway,' routing calls among such cities as Denver, Albuquerque, Dallas, Lubbock, and Amarillo."

Piggyback Strategy



Piggyback Strategy

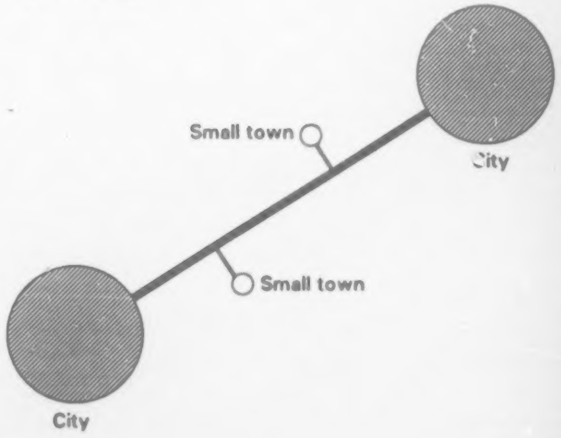
Because telecommunications networks of many large corporations often extend to remote rural areas, one sharing strategy is to resell the excess capacity of the private networks to these rural communities, whose telecommunications needs are likely to be relatively small.

As an example of this strategy, EMRG, a software company in Kearney, NE, which depends heavily on telecommunications, uses the excess capacity of the POP (point of presence, or telecommunications' equivalent to an on/off ramp) installed on the premises of Cabela's, the large sportswear retailer.

Tap-In Strategy

In the last few years, the competing long-distance carriers have rapidly modernized their networks and have installed high-capacity fiber optic lines connecting the major metropolitan areas. These lines by necessity crisscross "the land between the cities," and many rural regions of the United States are "hookable" into these networks with comparatively little cost.

Tap-in Strategy



SOURCE: Harmeet Sawhney, University of Texas at Austin, contractor material prepared for the Office of Technology Assessment, January 1991.

floor. When would I ever have time to learn about how to use communication strategically?

Nor are there many people to whom rural businesses can turn for help. In a competitive environment, many communication vendors are focusing their energies on the needs of the much more lucrative large business user. And among those who have typically supported rural businesses in the past—e.g., the agricultural extension agent, the economic development official, or the local chamber of commerce—few are even cognizant of the business opportunities that new technologies afford. Thus, it is not surprising that in most of the instances when a rural business, or a rural business community, has been successful in deploying new technology effectively, there has generally been a highly knowledgeable, energetic, and visionary individual involved.

Chapter 4

Rural Development

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Chapter 4
Rural Development

Findings

Telecommunications and information technologies can play a critical role in rural development. If they are not integrated into a comprehensive development plan, however, these technologies could do more harm than good. For too long, economic development has meant industrial recruitment. In a global economy, where skilled labor and high information content provides the competitive advantage, this strategy is outdated. If information technologies are deployed for the sole purpose of attracting information-intensive jobs to rural communities, they will merely add a high-tech dimension to the traditional smoke-stack chasing development strategies that have failed in the past.

For development to work, a multitude of factors must come together to create a self-sustaining process. Rural communities must improve their education, health care, and public administration capacities in addition to improving local employment and income levels. A successful development strategy will take inventory of a community's assets and weaknesses. When the health and education levels are so low that the community can only accommodate marginal employment, a development strategy must focus on raising the skills and level of health in the community. When human resources are adequate for development, but jobs are lacking, a development strategy must address ways to increase local employment. Most often, these problems cannot be solved in isolation, but must be attacked in a comprehensive development strategy.

Communications technologies can augment these various types of development efforts. When development is undertaken comprehensively, the role of telecommunications can be even more effective because the technology can bring the many community development players together to share the risks, the benefits, and the costs.

Introduction

Communications and information technologies offer rural areas the opportunity to overcome the traditional barriers of time and space, to attract high-paying, high-technology, information-intensive jobs, and to access information that could improve health care, education, and local government. However, these technologies are not a panacea. Rural economic development is a complex process that requires interaction among a multitude of players and institutions. Communications and information technologies can enhance and even make this process possible. However, if they are considered a solution by themselves, they will not fulfill expectations and could work against the prospects for real economic development in rural areas.

To make the most of communications and information technologies, a broad, holistic view of economic development is needed. Traditional economic development definitions, goals, and strategies have taken a one-dimensional approach, focusing on the business sector of a society or community and measuring development progress with standard economic indicators. These approaches ignore the less quantifiable factors, such as the quality of the laborforce, and access to education and health care, that allow businesses and people to develop and prosper.

In contrast to this purely business approach are community development approaches. They seek to develop community well-being as a means of generating economic well-being. However, when pursued along a single social dimension, they too have failed. Just as economic activities need support from community services, so does community infrastructure need economic energy to remain viable. Community development projects can stimulate the economic development process, but alone, they will be only partially successful.[1]

---

[1] Jane Jacobs explains the fallacy of using grants for community development projects alone to produce economic development: "The failure is built into the fact that they *are* loans, grants, and subsidies; those golden eggs, being only eggs, don't hatch goslings." The key to success is the presence of innovative activity, which transfer payments could then invigorate. Jane Jacobs, *Cities and the Wealth of Nations: Principles of Economic Life* (New York, NY: Vintage Books, 1984), p. 110. See also, Ted K. Bradshaw, "Economic Development in Rural America: The Hard Case," *Looking Ahead*, vol. 9, No. 2, 1986.

A narrow focus on technology can also lead programs astray. Typically, policymakers see magic powers in technology, or they use technology as a disguise or means to accomplish other narrow economic objectives. Whether policymakers look for a solution in technology, business, or community infrastructure, by seeking a tonic, they neglect to consider the many factors that go into making and sustaining a successful development formula.[2]

What Do We Mean by Economic Development?

In formulating strategies and policies for rural economic development, it is critical to understand what economic development is and what it entails. Contemporary rural America presents a mosaic of socioeconomic and political conditions and various levels of development, so a narrow concept of economic development is inappropriate. A workable definition of economic development must accommodate the inherent differences between communities, and allow for alternative approaches to the problems.

The economy and the community are inextricably linked, therefore, this report is based on the premise that economic development encompasses community development. The linkages between the community and the economy in rural areas are critical. Due to the small population of a rural community, there is less social redundancy. Often, a few businesses, or one large business, one school, and one hospital or health-care provider serve the entire community. If a school or business closes, rural citizens cannot simply go to a different school, or merchants cannot find other suppliers. Thus, if one community link fails, the entire system is jeopardized.

Economic Development Is Not Just Jobs and Income

Viewing community development as an integral part of economic development requires measurements that focus on quality of life considerations, such as health and social services and quality educational opportunities for children and adults. These factors are inputs, as well as products, of economic well-being. As such, these non-material necessities must be considered as "important condition[s] to meeting material needs."[3]

Photo credit: Mark G. Young

Sign in a small town in rural Kentucky announcing a construction project funded by the Department of Commerce's Economic Development Administration.

Standard economic indicators, such as employment and income levels, are often used to measure economic well-being but do not account for these important amenity factors. Too often, the measures become ends unto themselves, and other less-quantifiable development goals are subordinated to the economic goals embodied in these measurements.

How Relevant Are Employment Levels to Economic Development?

Development officials and policymakers, for example, typically use jobs and income as measures of economic well-being. In this case, economic development plans and policies seek growth in regional employment as the key to greater economic—and hence overall—well-being.[4] Such a strategy links employment growth to lower unemployment and higher incomes; it assumes a causal relationship from jobs to income to community welfare. At first glance, this strategy seems to make sense. And, in fact, the logical progression from economic growth to greater well-being is supported in much of classical economic literature.[5]

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[2] The industrial park strategies of the 1970s illustrate such an approach. In many cases, it was believed that industrial capacity—in terms of office and warehouse space—would induce firms to locate in a region and thus provide jobs and then tax revenue to pay for social services and community infrastructure. As a result of this strategy, however, many industrial parks lay vacant and communities were disappointed or disillusioned because they could not attract or nurture businesses, which also demanded an educated workforce and access to community services and health care for potential employees.

[3] Paul Streeten, "A Basic Needs Approach to Economic Development," Kenneth P. Jameson and Charles K. Wilber (eds.), *Directions in Economic Development* (South Bend, IN: University of Notre Dame Press, 1979), p. 74.

There are, however, flaws in this approach. First, there is little evidence that employment growth necessarily produces income growth.[6] An increase in the number of jobs in an area does not imply that the wage levels or the quality of jobs increases.[7]

Job recruitment strategies also fail to recognize that imported jobs often attract imported labor. When this occurs, the unemployment in the community can persist even though employment statistics have risen. If industrial recruitment strategies were to attract enough outside labor to create a surplus labor pool, they could actually depress the local wage level. Even when indigenous workers become employed, they might remain poorly paid or underemployed due to greater competition for jobs. The workforce in rural areas is generally small, so rural communities are particularly vulnerable to competition from imported labor.

Additionally, the types of jobs that can result from job recruitment strategies vary significantly. Even if one assumes that any job is better than no job, it is still important to consider factors that might determine whether local workers would consider the imported jobs desirable or within their reach.

Even after acknowledging these shortcomings, planners might still choose an industrial recruitment policy, hoping to capture the "multiplier effect" that additional jobs might create. They assume that population growth from the influx of new workers will stimulate the economy and increase the demand for services.[8] Under these circumstances, indigenous workers might find employment in the growing service sector. However, the service sector typically pays low wages. This type of employment growth might not raise the income levels of the indigenous workers, whom the development was intended to benefit.[9] Job creation is a sensible goal,[10] but job creation—in and of itself—is only one part of economic development.

What Do Income Statistics Tell Us?

Just as higher employment measures do not necessarily lead to higher income, neither do higher income levels necessarily produce greater economic well-being.[11] Development policies that equate income levels with well-being can result in misguided and unproductive strategies.

---

[4] As Lionel Beaulieu notes: ". . .over the past 25 years, the primary concern of State and local development officials in the South has been with creating as many jobs as possible." Lionel Beaulieu, *The Rural South in Crisis: Challenges for the Future* (Boulder, CO: Westview Press, 1988), p. 266.

[5] Classical economists, starting with Adam Smith, presumed that the proceeds from economic growth, even if they accrued to only one segment of society, would trickle down through the whole society. They also presumed that increases in national monetary wealth—or gross national product—would improve living conditions for the citizens of the Nation. Largely this was the case because there is a strong correlation between greater wealth and greater amenities. Nonetheless, the relationship is not necessarily causal. Moreover, the forces at work in a national economy may differ significantly from those of a regional economy. For example, labor is much less mobile at the national level than at the local or regional level. As a result, labor can move in or out of a region, depressing wages but increasing employment levels. Such activity dramatically affects the local economy, but is less apparent at the national level.

[6] Thomas Michael Power, *The Economic Pursuit of Quality* (Armonk, NY: M.E. Sharpe, Inc., 1988).

[7] Beaulieu explains that the development programs that focused on creating jobs failed because ". . .[w]hether these jobs were white collar or blue collar, high wage or low wage, dead-end or on a promotion track was overshadowed by the overwhelming desire to report job numbers. . ." op. cit., footnote 4, p. 266.

[8] Gene F. Summers, "Rural Industrialization," *New Dimensions in Rural Policy*, Joint Economic Committee, June 5, 1986. The magnitude of this multiplier effect is much smaller than expected. Figures range from zero to 3.0, but the average is around 0.30; this means that for each job that a recruited firm adds to the local economy directly, it will also generate 0.30 jobs in the community indirectly. These jobs typically will be in the service sector, supporting the new economic activity.

[9] Thomas Michael Power, "The Folk Economic of Local Economic Development: 'Intuitively Obvious' But Dubious Strategies," unpublished paper, University of Montana, 1988.

[10] Louis Swanson, "Non-Technical Barriers to the Use of Telecommunications Technologies for Rural Development," contractor report prepared for the Office of Technology Assessment, 1990, p. 23

[11] Thomas Michael Power, "Measuring Economic Well-Being in Non-Metropolitan Areas," contractor report prepared for the Office of Technology Assessment, May 1990. See also, Power, *The Economic Pursuit of Quality*, op. cit., footnote 6.

Per-capita income levels paint a cloudy picture of economic well-being. Per-capita income says nothing about the relative distribution of income. Therefore, the statistic will rise when the income of any portion of the population rises, whether the increase was shared across all sectors or concentrated in a small group. A development strategy to raise per-capita income could do so without affecting the income level of the majority of the population.

Per-capita income also does not account for differences in the cost of living between regions, or changes in cost of living over time. An area with a lower cost of living[12] usually will report a lower per-capita income. A lower income level does not necessarily mean that the population is economically worse-off than a region with a higher per-capita income since it may cost more to live in the "richer" region. Efforts to equalize per-capita income with other regions will be misguided if they ignore this caveat.

Per-capita income also does not reflect differences in the quality of amenities needed for personal well-being. These include factors such as climate, leisure opportunities, absence of crime, quality of schools, and cultural opportunities.[13] The status of such amenities must be included in any development strategy (see box 4-A).

Holistic Economic Development

A "large part of economic well-being is determined by the quality of nonmarketed [and nonmeasured] resources,"[14] which are essential to economic development. In this sense, economic development embodies community development.[15]

A community-based rural economic development program would improve the lives of rural people,[16] wherever they eventually may reside.[17] It would create an environment in which people can choose to live—because basic services, amenities, and jobs are available—or from which they can migrate with adequate skills to make their ways in other communities. It would be sensitive to the type of future that members of the community envision for the community. Such a development program may or may not include an aggressive economic growth strategy. If pursued, a growth strategy would constitute only part of a more comprehensive recipe for rural economic development. The importance of a holistic development strategy is that it builds on the relationship between the community infrastructure and a vital economy.

A holistic approach to rural economic development requires policymakers to look for more than a technological fix aimed at a single sector of the community. When determining how communications and information technologies can affect rural economic development, it is critical to consider the quality of each of the elements of economic development and how these technologies can address the many dimensions of economic development.

Setting Goals

Rural development goals must be both consistent with a holistic definition of economic development and suitable for addressing the breadth of the problems and conditions found in rural America. It would be unrealistic to set uniform standards that all

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[12] Problems also arise in using cost of living as a comparative statistic. The American Chamber of Commerce Research Association (ACCRA) publishes cost-of-living data quarterly for 250 cities. This data is based on the cost of a prespecified "market basket" of goods. Although useful, such a measure does not account for regional differences in the availability or cost of the components of the "market basket." Additionally, the costs of housing and labor vary across regions; also, the proportion of income that people spend on housing has varied significantly over time. These factors affect the cost-of-living, but are generally not reflected or accounted for in cost-of-living data that are used in comparisons. Nonetheless, adjustments to cost-of-living data that would discount for these realities are not regularly made, or even generally feasible, since there is no systematically collected, reliable data set that would allow such adjustments. The ACCRA data are plagued with problems of consistency and reliability. Power, "Measuring Economic Well-Being," op. cit., footnote 11, p. 7.

[13] Economic theory suggests that the effects of these qualitative factors will be reflected in people's choices of where to live. Attractive areas (other things, such as cost of living, being equal) will have lower wages and incomes; conversely, unattractive areas will have higher wages and incomes. In essence, people will "pay" to live in attractive areas and "charge" to live in unattractive areas. This theory does not, however, account for the fact that still other qualitative factors, such as family ties, influence decisions about where to live.

[14] Power, *The Economic Pursuit of Quality*, op. cit., footnote 6, p. 15.

[15] Vernan D. Ryan, "The Significance of Community Development to Rural Economic Development Initiatives," United States Department of Agriculture, *Rural Economic Development in the 1980's: Prospects for the Future* (Washington, DC: USDA Economic Research Service, 1988), Rural Development Research Report, No. 69, p. 364.

[16] Jonathon Sher, "Rural Development Worthy of the Name," *New Dimensions in Rural Policy: Building Upon Our Heritage*, studies for the Subcommittee on Agriculture and Transportation of the Joint Economic Committee, 1986.

[17] Luther Tweeten, Professor, Ohio State Univesity, comments at Panel Meeting, July 30, 1990.

Box 4-A—Alternative Measures of Economic Well-Being

No single measure will fully capture the array of qualities and quantities that comprise economic well-being. Rather than using one composite measure as a guide to development strategies, developers might consider using alternative economic indices to create a more complete picture.

For example, quality-of-life indicators are increasingly used in the popular press to rate a city's "livability." These indicators take account of characteristics such as the quality of schools, research facilities, cultural opportunities, climate, the availability of capital and skilled workers, and the extent of union membership and the political climate. Although useful for qualitative impressions, such measures are limited due to the arbitrariness of the included factors and their inherent subjectivity.

Another attempt to measure development is the "Physical Quality of Life Index" (PQLI). The PQLI is used primarily in the international development community. This composite index uses indicators of infant mortality, life expectancy, and basic literacy to measure results of development efforts in meeting the most basic needs of a community. The PQLI is useful in assessing the extent of serious poverty, but is limited in the extent to which it can measure the economic activity of a region.

SOURCES: Hazel Henderson, "Mutual Development: Towards New Criteria and Indicators," *Futures*, December 1989, pp. 571-584. Gerald M. Meier, *Leading Issues in Economic Development* (New York, NY: Oxford University Press, 1989), p. 9.

rural communities must meet, but it is necessary to identify objectives to guide development efforts.

The Basic Framework

Thomas Power suggests several goals for holistic economic development[18] that provide a flexible framework for any community. These objectives include:

- the availability of useful and satisfying work for community members;
- access to biological and social necessities;
- stability in the local community; and
- a thriving, vital local economy.

This list is consistent with the goals of rural development policy defined by Kenneth Deavers,[19] which call for:

- improved rural income levels and employment opportunities;
- improved access by rural residents to adequate housing and essential community facilities and services; and
- responsible use of rural resources and the rural environment to preserve the rural quality of life.

Together, these sets of goals provide for the development of a rural environment that supports the health and well-being of people as well as the businesses they patronize, work at, and/or operate. By addressing both the human and the business conditions in a community, they recognize the fundamental linkages between these two aspects of community life.

Employment and Income

GOAL 1: The availability of employment opportunities that are useful and satisfying, and which provide income levels consistent with the income needs of the region.

This goal must incorporate the quality of employment, including the challenge and the opportunity for advancement, in addition to the income levels associated with such employment. Both aspects of employment are important to the individual and to the community.

Rural workers need jobs, but they also need employment that uses their skills and abilities and that affords them a reasonable standard of living. In addition to compensation, employment gives workers an identity, personal satisfaction, status in the community, and a stake in the sociopolitical system. By giving workers a place in their community,

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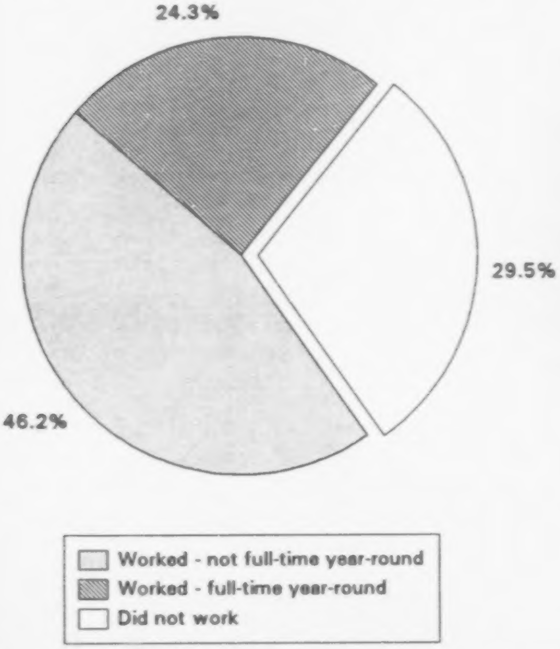
[18] Power, *The Economic Pursuit of Quality*, op. cit., footnote 6, pp. 169-174.

[19] Kenneth Deavers, "Social Science Contributions to Rural Development Policy in the 1980's," *American Journal of Agricultural Economics* 62(5), pp. 10-21. Cited in Gary P. Green and Kevin T. McNamara, 1988, "Traditional and Nontraditional Opportunities and Alternatives for Local Economic Development," in Beaulieu, *The Rural South in Crisis*, op. cit., footnote 4.

Figure 4-1—Employment Status of Nonmetro Poor*



Nearly a quarter of the rural poor work full-time year-round, and nearly half work part-time and/or in seasonal employment.

* Family houseowners who were not ill, disabled, or retired, 1987.

SOURCE: Calculations based on U.S. Census Bureau data, as cited in Center on Budget and Policy Priorities, *Laboring for Less: Working but Poor in Rural America* (Washington, DC: 1990), p. 5.

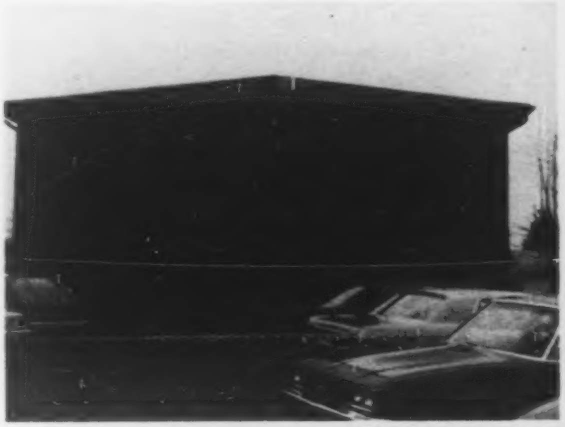


Photo credit: Mark G. Young

A multipractice community health clinic in Charles Town, West Virginia.

employment also builds a larger sense of civic consciousness.[20]

Jobs must also provide adequate income for workers. More than 70 percent of the poor in nonmetro areas work full- or part-time during the year (see figure 4-1).[21] For a variety of reasons, jobs in rural areas often do not pay enough for workers to emerge from poverty. Among the year-round, part-time workers in rural areas, 39 percent are underemployed. Many work part-time not because they prefer to, but because it is the only available employment.[22]

Health and Well-Being

GOAL 2: Access for community members to necessities, such as health services and adequate housing, as well as to social necessities, such as government services, and educational opportunities.

The health and social welfare of the people are essential elements to a community's economic and overall well-being. A healthy population living in adequate housing is a minimum standard for community welfare and a productive workforce. Though more difficult to identify, social necessities are indispensable to a community's well-being. They include, for example, government services ranging from postal delivery to police and fire protection to education. Education is especially important.[23] It is fundamental to gaining useful and satisfying work and "shape[s] a population's ability to devise new solution[s] to problems, [and] adapt to change,"[24]

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[20] Edward J. Blakely, *Planning and Local Economic Development: Theory and Practice*, vol. 168, Sage Library of Social Research (Newbury Park, NJ: Sage Publications, 1989), p. 17. Also, Power, *The Economic Pursuit of Quality*, op. cit., footnote 6, p. 171.

[21] Center on Budget and Policy Priorities, *Laboring for Less: Working but Poor in Rural America* (Washington, DC: 1990), p. 7. The poverty rate among nonmetro workers has risen in the past decade, despite the Nation's economic recovery.

[22] J.F. Coates, Inc., "Work in Rural America," contractor report prepared for the Office of Technology Assessment, 1990, p. 22.

[23] As Skees and Swanson explain, "The single most important factor associated with the well-being of rural communities is the level of education among the adult population." Joint Economic Committee, Jerry R. Skees and Louis Swanson, "Southern Education, Poverty, and Rural Development: The Case for New Policy Assumptions," *Towards a Rural Development Policy for the 1990s*, 1989, p. 78.

[24] Linda L. Swanson and Margaret A. Butler, "Human Resource Base of Rural Economies," in USDA, op. cit., footnote 15, p. 157.

Box 4-B—Communications and Development: The Other Edge of the Sword

Since 1962, Wal-Mart stores have become staples in many small towns across the country, especially in the South. They have been a boon to rural consumers because of the wide variety of products they offer at discount prices, consolidating the services of many stores into one discount center.

Wal-Mart is often heralded as a triumph of technology. The discount retailer has staked its claim in rural America by using sophisticated telecommunications technologies to transmit data and voice and video messages that allow the company to purchase and distribute a huge variety of consumer goods at prices far below the local competition. Using very small aperture terminals (VSATs), Wal-Mart coordinates its purchasing at a national level and thus takes advantage of the market power it enjoys by virtue of its size.

Although these discount retail stores can be a great deal for rural America, communities are discovering that sometimes stores like Wal-Mart are no bargain. In the wake of the Wal-Mart phenomenon lie the empty storefronts of the many local businesses that could not compete. Businesses in surrounding communities often suffer as well because of the magnet effect that a discount retailer creates in a region. People will drive longer distances to reach the discount prices and one-stop shopping. While as consumers, rural citizens are enjoying the cut-rate prices, as employees and entrepreneurs, rural residents are suffering from the layoffs that result from the closing of local businesses. In many rural towns, the closing of even a few stores has a suffocating impact—as much on the psyche of the community as anything else.

In addition to suffering the losses of local businesses, rural economies can suffer because the revenues of national retail chains return to corporate headquarters, rather than circulate through the local economy as they might have with a locally owned business. Thus, if rural communities are not braced for the kinds of changes that technology could bring, economic development boons like Wal-Mart and other similar ventures could develop into economic busts.

SOURCE: Lisa Belkin, "Wal-Mart is Closing, And Texas Town Reels," *New York Times*, Dec. 14, 1990, p. A-18.

qualities that are integral to maintaining community welfare.

Stability With Vitality

GOAL 3: Local participation in the development of a stable and vital community.

Stability and a sense of local control go hand in hand as critical ingredients for establishing an environment where people and enterprises can flourish. Local control vests decisions and planning for the community's future with those who stand to benefit or lose in the process—the residents of the community (see box 4-B). Jonathan Sher notes that too often in the past this has not been the case. Because development has been done "*to* rural communities rather than *by* them,"[25] the fruits of rural development have not accrued to rural citizens.

The benefits of a development scheme could easily evaporate if it is based solely on an outside business that might relocate elsewhere as soon as it became advantageous. Such is the case when footloose manufacturing firms uproot local operations to move production overseas, where wages are lower. This pattern has repeated itself in many rural areas throughout the 1980s.[26]

As Bradshaw points out, "rural development programs throughout the country still seem to be designed to capture the benefits of outside firms and to neglect the development of local resources."[27] For sustainable development, a measure of self-sufficiency is necessary. To be self-sustaining, rural communities must avoid dependence on a single firm, industry, or outside government agency; they must seek alternatives in which to participate as equals, rather than as pawns in the development game.

Economic stability, however, does not imply inflexibility. To the contrary, communities that cannot adapt to changes will be vulnerable to, and dependent on, outside forces. As Kenneth Wilkinson explains, "dependency depresses adaptive capacity."[28] Thus, stability and adaptability are complementary and interdependent qualities.

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[25] Sher, 1986, "Rural Development Worthy of the Name," op. cit., footnote 16, p. 519. (Emphasis in text.)

[26] Thomas Lyson, "Economic Development in the Rural South: An Uneven Past—An Uncertain Future," in Beaulieu, *The Rural South in Crisis*, op. cit., footnote 4, p. 266.

[27] Ted K. Bradshaw, "Economic Development in Rural America: The Hard Case," op. cit., footnote 1.

Prerequisites and Obstacles

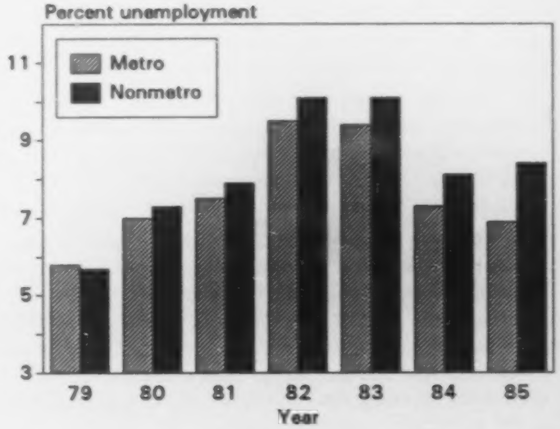
Structural changes in the national and global economies have substantially changed many of the prerequisites and obstacles to meeting rural development goals. In many cases, obstacles and prerequisites are two sides of the same coin: the absence of a prerequisite becomes an obstacle to development.

Structural Economic Obstacles

Global economic trends caused significant structural changes in the national economy throughout the 1980s and into the 1990s, but these forces have affected rural areas differently. Dependent on single industries or larger urban economies for their livelihood and well-being, rural areas have not had the resources of a diverse economy and a broad-based social infrastructure to make the necessary adjustments.[29] As a result, some of the obstacles to rural economic development have increased.

The factors that gave rise to the recession of the early 1980s had a far greater impact on rural areas than on urban ones. These included rising energy prices, tighter credit, a U.S. grain embargo, a glut in the world market for oil and other energy resources, and heightened foreign competition, especially from Third World countries. In the wake of these developments, rural unemployment soared relative to urban areas,[30] wages and salaries grew at a much slower rate,[31] and rural poverty rates increased by nearly one-third between 1978 and 1987 (see figure 4-2).[32]

Figure 4-2—Unemployment Rates: Metro and Nonmetro



SOURCE: Bureau of the Census, Current Population Survey, as cited in USDA, *Rural Economic Development in the 1980's: Prospects for the Future* (Washington, DC: U.S. Department of Agriculture, 1988), p. 3.

The decline of U.S. manufacturing was largely responsible for the severity of the economic downturn in rural areas. Many rural jobs depend on the fate of urban manufacturing industries. For example, when the U.S. auto industry declined, many rural manufacturing plants that produced components or parts shut down. Other industries, such as textiles, clothing, and leathergoods, were located in rural areas where the impact of the decline was directly felt (see figure 4-3).[33]

Nearly 40 percent of nonmetro counties depend primarily on manufacturing for employment, so the strains of rural manufacturing have affected a large portion of this rural population.[34] These employment losses are likely to be permanent because many jobs have disappeared as a result of the structural

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[28] Kenneth P. Wilkinson, "In Search of Community," *Rural Sociology*, vol. 51, No. 1, 1986, p. 8.

[29] For a discussion of these global and national forces acting on rural economies, see David Freshwater, "Rural Development and Telecommunications Policy," presentation for Apr. 19, 1990 conference on Telecommunications and Rural America at Corning, NY.

[30] Rural unemployment grew from 5.7 percent in 1979 to 10.1 percent in 1982; at the same time, job growth in urban areas merely slowed down. As a result, the gap beween rural and urban unemployment rates grew. In the early 1980s, the average rural unemployment rate was 7 percent higher than the urban rate; by 1987, it was 40 percent higher. Parker et al., *Rural America in the Information Age: Telecommunications Policy for Rural Development* (Lanham, MD: The University Press of America, 1989), pp. 17-19.

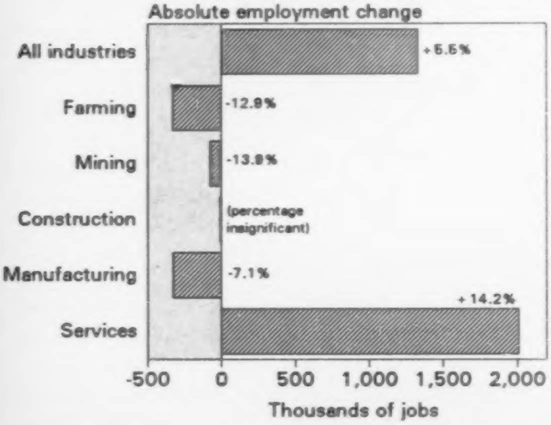
[31] Nonmetro wage and salary employment increased by about only 1 percent, compared with a gain of almost 6 percent in metro areas. Herman Bluestone and Celeste A. Long, "Growth Falters in Most Rural Counties: Manufacturing Both Hero and Goat," *Rural Development Perspectives*, February 1989, p. 9.

[32] Center on Budget and Policy Priorities, op. cit., footnote 21.

[33] Brown and Deavers point out: "Many rural manufacturing plants were linked to the struggling auto and steel industries. . .[while] the textile, clothing and leather goods industries, which are concentrated in nonmetro areas, also suffered from stronger import competition during this period." David L. Brown and Kenneth L. Deavers, in USDA, op. cit., footnote 15, p. 3.

[34] Idid., p. 5.

Figure 4-3—Employment Change in Nonmetro Counties, 1976-86



The rise in service jobs accounts for the overall growth of jobs despite employment losses in manufacturing, farming, and mining.

SOURCE: Edwin B. Parker et al., *Rural America in the Information Age: Telecommunications Policy for Rural Development* (Lanham, MD: University Press of America, Inc., 1989), p. 18.

shift in the U.S. economy away from routine manufacturing jobs toward more high-technology manufacturing and services jobs. Urban areas are better able to adapt to this trend, thus such jobs are most prevalent in urban areas.[35] Add the farming crisis and the industrialization of U.S. agriculture to the decline of rural manufacturing, and the result has been fundamental and permanent structural changes in much of the rural economy.

Such changes would wrench any economy, but rural areas were particularly hard hit because they often lacked access to information that would inform them better about *how* to react and adapt. Urban areas, in contrast, are usually the locus of innovation and information, and support more specialized services and occupations that create a cycle of information creation.[36] This urban dynamic enables cities to adjust to changes more easily and provides them with a competitive advantage over rural areas in attracting and retaining industries.

A mismatch between the needs of a structurally changed global economy and the ability of human resources and physical capital in rural areas to adapt is at the root of the problem. Many rural areas can accommodate "1960s style growth," which calls for industrial parks and vocationally trained workers. The global marketplace, however, has redefined what is now necessary for growth. A skilled workforce and sophisticated communications have become primary ingredients for growth.[37] Many rural communities were never even "primed for 1960s style growth," but they relied on the resources and traditional industries that had always supported them, such as farming and extraction.

A shortage of investment capital compounds the difficulties that rural areas face in adapting to new economic conditions. Many argue that the financial deregulation of the 1980s reduced the amount of credit available to rural areas. The centralization of the American banking system, which resulted from deregulation, tended to shift banks' investment decisions from "locally owned community banks to the main offices of state and regional banks."[38] As credit markets became globalized, and investment decisions more detached from local communities, lenders increasingly turned away from rural investments in favor of larger and more profitable investments in the international credit market.[39]

Most likely, those rural areas most in need of capital pose the greatest risk to creditors. Venture

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[35] Ibid., pp. 5-6.

[36] As David McGranahan observes, ". . . Small towns and rural areas are generally the last to get new information. Not only do most innovations occur in urban settings, but even when the innovations are rural, information about them tends to flow first to urban places and then to other rural areas. . . . With a larger volume of information and trade flows, larger communities have more specialized services and occupations, and larger organizations with economies of scale." David McGranahan, in USDA, op. cit., footnote 15, pp. 30-31.

[37] Thomas A. Lyson, "Economic Development in the Rural South," in Beaulieu, op. cit., footnote 4, p. 267.

[38] Gary P. Green and Kevin T. McNamara, "Traditional and Nontraditional Opportunities and Alternatives for Local Economic Development," in Beaulieu, op. cit., footnote 4, p. 290.

[39] The extent to which financial deregulation actually constrains available capital for rural areas is uncertain because it is too early to accurately assess the full impact of deregulation. Daniel L. Milkove and Patrick J. Sullivan, "Should Rural Communities Fear Bank Deregulation?" United States Department of Agriculture, Economic Research Service, *Rural Development Perspectives*, February 1989. When community banks can coexist with branches of larger, regional banks, customers find a greater array of choices and available credit. Moreover, the larger regional banks could offer advantages for rural areas. The financial and informational resources available to these larger, broad-based institutions enable them to extend credit to innovative businesses, whose lines of business would not be familiar to small local bankers. The larger and more diversified portfolio of a regional bank could allow it to take risks on small businesses that would be poor risks for banks with smaller portfolios. Even if this hopeful scenario bears out, however, opportunities will primarily exist in areas with relatively vibrant economies and promising investment opportunities.

Photo credit: Mark G. Young

Jefferson Finance, a community bank in Charles Town, West Virginia.

capitalists are in the business of providing capital for high-risk investments, but they typically concentrate their investments to urban areas, "where they can more closely monitor their borrowers."[40] Moreover, it is unlikely that a rural area in need of credit to generate economic and community activity could yield a large enough return to attract venture capital.[41]

The lack of venture capital combined with the conservative lending policies of most locally owned rural banks[42] means that most rural communities face difficulties raising investment capital. The neediest face the greatest obstacles in obtaining credit. Part of the problem is the lack of knowledge within the community about how to deal with financiers.[43] Business plans and financial information are standard parts of a loan application, but they can be obstructions as well as screening devices.

Human Resource and Social Infrastructure Obstacles

Workforce Skills

A mismatch between the qualities of the rural laborforce and the needs of a diversified and information-intensive economy constitutes an obstacle to holistic development. The skills of factory workers, farmers, and miners do not correspond to the needs of the growing service sector or high-tech manufacturing.[44] But retraining these workers for jobs that do not exist does little good either.

One possible "advantage" of the rural laborforce is the availability of an isolated, low-skill pool of workers in need of any kind of employment. Willingness to work for few, if any, benefits and minimal union activity are sought after features for marginal enterprises, which are unlikely to create the kind of jobs that improve economic and social well-being in the community. Education levels largely determine the type of "advantage" a laborforce offers. Low educational attainment translates to a low-skilled rural laborforce with a perverse "advantage" relative to urban areas. The persistent disparities between metro and nonmetro educational levels suggest that should high-skill jobs be created in rural areas, they would be difficult to fill (see figure 4-4).[45]

As more skills and greater sophistication and adaptability are required from the global laborforce, populations that do not stack up will suffer. During the 1980s, rural areas experienced the beginnings of the globalization trend. Rural areas must change the nature of their laborforce "advantage" in order to

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[40] Green and McNamara, op. cit., footnote 38, p. 297.

[41] Peter S. Fisher explains, "the more rural sections of the US contribute relatively little to, and receive relatively little from, the venture funds." Joint Economic Committee, "Risk Capital and Rural Development," *Towards A Rural Development Policy for the 1990s*, 1989, p. 137.

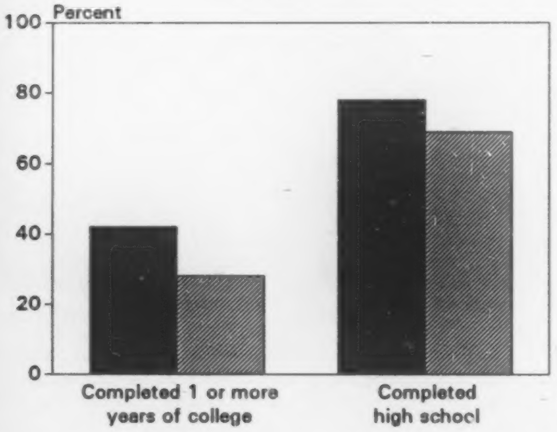
[42] Joint Economic Committee, James J. Mikesell, Daniel L. Milkove, and Patrick J. Sullivan, "Commercial Banking Systems Serving Rural Counties: Their Current Structure and Future Prospects," *New Dimensions in Rural Policy*, Joint Economic Committee, June 5, 1986, p. 406.

[43] Fisher, op. cit., footnote 41, p. 139.

[44] Brown and Deavers, op. cit., footnote 33, p. 25.

[45] David Freshwater in Joint Economic Committee, op. cit., footnote 23, p. 10.

Figure 4-4—Educational Attainment: Urban and Rural



SOURCE: U.S. Department of Agriculture, *Rural Economic Development in the 1980's: Prospects for the Future* (Washington, DC: U.S. Department of Agriculture, 1988), p. 20.

attract challenging and skilled employment for its citizens.

Health

A healthy population is necessary for economic development, but rural health care is facing a crisis situation. Access to health care in rural areas is more limited than in urban areas, yet rural areas often have greater needs for health services because the population has relatively more elderly and children than urban areas. Remoteness and poverty, combined with a shortage of trained medical personnel, technology, and transportation, make health care even more inaccessible to rural residents (see table 4-1).[46]

In many ways, rural areas face a "Catch-22" in health-care provision. The lack of access to adequate health care is an obstacle to economic and community development; yet, other development barriers also limit access to health care. Low-income groups have greater difficulty in obtaining health care, and poverty aggravates both the problems of providing health care in rural areas and the state of health of the rural population. For example, high infant mortality in rural areas is associated with low incomes. Additionally, inadequate health insurance discourages people from seeking preventative and primary care until there is an emergency (see figure 4-5).[47]

Table 4-1—Differences in Selected Health Indicators

	Metro	Nonmetro
Infant mortality[a]	9.88	10.07
Chronic disease[b]	12.6%	14.9%
Overall health[c]	14.1	14.7

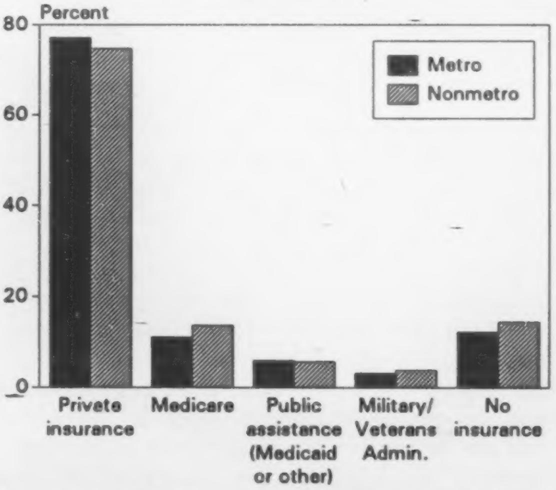
[a]Deaths per 1,000 liveborn infants under age 1—1987.

[b]Percent of respondents with activity limitation due to chronic conditions—1988.

[c]Number of restricted days per person—1987.

SOURCE: Office of Technology Assessment, *Health Care in Rural America*, OTA-H-434 (Washington, DC: U.S. Government Printing Office, September 1990), p. 44.

Figure 4-5—Percent of Population with Health Insurance—1984



Nonmetro population has a higher percentage of people with no insurance and a smaller percentage covered by private insurance. The higher percentage of Medicare reflects the larger proportion of elderly among the rural population.

SOURCE: Office of Technology Assessment, *Health Care in Rural America*, OTA-H-434 (Washington, DC: U.S. Government Printing Office, September 1990), p. 48.

Rural socioeconomic factors work against rural areas in attracting health-care professionals. This problem results from two aspects of rurality: First, physicians tend to locate in urban areas, where the population is larger and well-equipped hospitals and clinics are more prevalent.[48] Second, during the 1980s, dramatic changes in the U.S. health-care environment created increased financial pressures for rural hospitals, resulting in higher costs, lower revenues, and lower inpatient admissions. As a result of the increased financial pressures, it has become more difficult for physicians to practice in rural areas.[49]

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[46] Leslie L. Clarke and Michael K. Miller, "The Character and Prospects of Rural Community Health and Medical Care," *American Rural Communities*, A.E. Luloff and Louis E. Swanson (eds.), (Boulder, CO: Westview Press, 1990), p. 92.

[47] Ibid., pp. 90-92.

Social Infrastructure

Many other factors contribute to the quality of human resources in rural areas. Among them are the array of public and private services and amenities that make up the social infrastructure, such as schools, hospitals, public safety, public and private cooperatives, and the quality of local government.[50]

The quality of local governments is often an overlooked factor in economic development. Local governments face increasing challenges from the many changes in the rural and national economies.[51] The Federal budget deficit means less money is available for federally backed rural programs. Rural areas feel this crisis from another angle as well. With increased competition for Federal funds, rural interests must understand the processes and have the information to coordinate activities in the community and establish contacts between the community and the larger society. Small, rural governments, however, often rely on volunteers or part-time administrators with inadequate resources for strategic planning or writing grant proposals that must meet technical regulations. Federal programs are biased toward urban areas because "larger, urban communities are better equipped to compete for resources since they are likely to have full-time, technical staffs who know how to play the grants game."[52] The same problem persists when rural communities seek financing from private sources.

Photo credit: Mark G. Young

A view of the newly built community plaza in Costilla, New Mexico, complete with a general store and restaurant, bed and breakfast, and sporting supply store to attract and accommodate visitors from a nearby ski resort.

A professional, technically knowledgeable government is also an important factor in coordinating economic and community development. One of the most important community development functions of government is working with the larger group of organizations that influence the community's destiny.[53] Because local involvement in development strategy is an essential element to success,[54] rural communities must overcome the substantial barriers that derive from being rural.

Leadership can manifest itself in local government, but businesspeople or commercial councils also play a major role. It is less important where to find leadership in a community than that it be present and resourceful. The key to successful development efforts often is access to information. Leaders need information from the community and from the larger national and global context. Information technologies, such as the telephone, allow information exchange and can enhance a sense of community.[55] Regulations that make telephone calls and information services more expensive for rural citizens discourage access to much needed outside information.[56]

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[48] Swanson, op. cit., footnote 10, p. 38. In 1985, rural areas had fewer than half as many physicians per 100,000 residents than did urban areas, and the ratio worsens as the population size of the rural area declines. While financial considerations play a role in this problem, because physicians can expect to earn less in rural areas than in urban areas, professional considerations are also important. The dearth of peers and professional development opportunities are important barriers to attracting and retaining medical professionals to rural areas. U.S. Congress, Office of Technology Assessment, *Health Care in Rural America*, OTA-H-434 (Washington, DC: U.S. Government Printing Office, September 1990), pp. 8-10.

[49] Insurance rates are a problem for both the rural patient and physician. Many rural poor are uninsured, so hospitals or doctors may not be reimbursed for care. Malpractice rates become a greater problem in rural areas because they do not reflect patient volume. Consequently, a rural physician must distribute the same costs faced by urban practitioners over fewer patients, increasing the cost of providing the care. For further reading, see OTA, ibid.

[50] Swanson, op. cit., footnote 10, p. 37.

[51] Glenn D. Israel and Lionel J. Beaulieu, "Community Leadership," in Louis E. Swanson and A.E. Luloff, *American Rural Communities* (Boulder, CO: Westview Press, 1990), pp. 181-183.

[52] Ibid., pp. 201-202.

[53] Ted K. Bradshaw, "Rural Development and Telecommunications: Potential and Policy," contractor report prepared for the Office of Technology Assessment, May 1990, p. 42.

[54] See Wilkinson, op. cit., footnote 28; Ted K. Bradshaw and Edward J. Blakely, *Rural Communities in Advanced Industrial Society* (New York, NY: Praeger, 1979); Bradshaw, op. cit., footnote 53; Clarke and Miller, *American Rural Communities*, op. cit., footnote 46; and Ryan, 1988, op. cit., footnote 15.

Other Obstacles

Distance from urban centers and small, dispersed populations characterize rural areas. These qualities account for the "bucolic and bubonic visions" of rural America.[57] These visions, though hyperbolic, illustrate that remoteness and small populations are often considered amenities of rural life, but they are also barriers to economic development. Distance from urban areas limits access to employment, goods, and services. This raises the transportation costs involved in buying or selling products in rural areas. At the same time, the small populations of rural areas diminish their ability to produce goods or services cheaply because they typically cannot achieve the economies of scale that reduce the unit cost of production.[58]

Remoteness and small populations also mean that "rural communities must choose between trying to do many things inefficiently or specializing in a small number of areas and facing high access costs for externally provided goods and services."[59] The industrialization of agriculture and the decline of rural manufacturing mean that many rural areas can no longer specialize, but do not have the resources to diversify. These communities, and the persistently poor rural communities, are not just experiencing another cyclical downturn in the economy, but are in danger of being excluded from the larger, national economy.

Urban-adjacent rural communities and those with a natural setting that can attract tourism or retirement communities have not fared as badly from the economic troubles of rural America.[60] One reason that urban-adjacent communities have more options is because they benefit from the economic diversity of the adjacent city. They also face lower prices for goods and services because the nearby urban areas support enough population to do many things efficiently. Further, they face relatively lower access costs for urban-produced goods and services than their more remote counterparts. Tourist and retirement communities benefit from the outside resources—both information and economic activity—to which they have access by virtue of the influx of people to their communities.

Nonurban-adjacent communities or those without potential for tourism typically are unable to develop a diverse economic and social structure. Yet, social and economic diversity are prerequisites to economic and community development,[61] for they permit access to resources that are fundamental to a self-perpetuating community. To attain this type of diversity, rural areas must reduce their isolation from the "resources and institutions of our essentially urban society."[62]

Strategies for Holistic Rural Economic Development

The nature, the number, and the severity of the obstacles facing rural communities vary widely. The diversity of the communities requires a variety of strategies for development. These strategies should address the underlying symptoms of distress and generate sustainable solutions.

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[55] Richard Kielbolwicz, "The Role of Communication in Building Communities and Markets: An Historical Overview," contractor report prepared for the Office of Technology Assessment, 1987.

[56] Chapter 5 addresses State and Federal telecommunications regulations that conflict with economic development goals.

[57] Joint Economic Committee, Jonathon Sher, "Rural Development Worthy of the Name," *New Dimensions in Rural Policy: Building Upon Our Heritage*, 1989, p. 515.

[58] Joint Economic Committee, David Freshwater, "A Synopsis of the Proceedings of the Rural Development Symposium," U.S. Congress, S.Prt. 101-50, *Toward Rural Development Policy for the 1990's* (Washington, DC: Government Printing Office, 1989), p. 6.

[59] Ibid.

[60] J.F. Coates, Inc., op. cit., footnote 22.

[61] Jacobs, op. cit., footnote 1.

[62] Wilkinson, op. cit., footnote 28.

Strategy Classifications[63]

There are many classifications and ways of organizing rural development strategies used by various levels of government and private groups. Rural development can be divided into categories such as agricultural programs, industrial development, infrastructure, or human resources. These categories are part of many effective development programs, but tend to reflect the missions of various government agencies rather than different development strategies.[64] The fact that each of these programs is relevant at different stages of development suggests that such classifications may be myopic from a sustainable development perspective. Effective development strategy classifications must be based on a more complete theory of development.

Type I Strategies: Building Individual Capacities

The most severely depressed rural communities lack most of the resources needed for rural economic development.[65] Firms in these communities are typically weak or dominated by outside interests that have little commitment to the community. Low levels of education and ineffective organization are obstacles to development in such communities. These depressed communities seem to get only the "bad news" about plant closures, falling farm prices, drought, or technological changes that pass them by. Local initiatives are generally limited to reacting to bad situations and keeping them from getting worse.[66]

Such counties and communities need direct assistance. Typically, the local economy has failed due to uncontrollable change or other problems, and efforts to recruit new employers have failed. Demands on community infrastructure rise at the same time that its capacity to meet these needs diminishes. In the absence of intervention, communities can be thrust into a downward spiral of poverty, where a lack of employment opportunities leads to high unemployment, personal poverty, and rural-to-urban migration.[67] The cycle continues because low personal income and the depletion of community resources erode the local tax base and lead to reduced public services such as education, health, job counseling, and community development. As a consequence, displaced and new workers do not get adequate training and services, available skilled jobs are unfilled, and businesses that could provide employment are neither retained, cultivated, nor attracted.[68]

The dominant strategy for depressed areas in a cycle of poverty is expenditures for the people in greatest need. This strategy assumes that human development is the fundamental building block for development. Absent human capacity, other efforts fail. Human resource development is a lasting investment that is transferable; if the rural economy falters and rural people leave for opportunities elsewhere, the migrants can take their skills and training with them.

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[63] Parts of this section draw on work done by Ted K. Bradshaw, "Rural Development and Telecommunications: Potential and Policy," contractor report prepared for the Office of Technology Assessment, May 1990.

[64] For example, the General Accounting Office, in its report on rural development, categorized programs in terms of economic development, agriculture and natural resources, infrastructure, and human resources. General Accounting Office, *Rural Development: Federal Programs that Focus on Rural America and its Economic Development*, Washington, DC: General Accounting Office report 89-56BR, January, 1989.

[65] Much of the rural South and parts of virtually all other States have regions of pervasive poverty and depressed living conditions that fall into this category. There are no available estimates of how extensive this problem is in the United States. A proxy measure might be the 242 persistently poor counties that were in the bottom quintile of a national ranking of nonmetro counties based on per-capita income from 1950 to 1979. (Thomas F. Davis, "Persistent Low-Income Counties in Nonmetro America" (Washington, DC: USDA, 1979), Economics, Statistics, and Cooperative Service, Rural Development Research Report No. 12. See also, Lloyd D. Bender et al., "The Diverse Social and Economic Structure of Nonmetropolitan America" (Washington, DC: USDA, Economic Research Service, September 1985), Rural Development Research Report No. 49. Among these regions are the persistent poverty counties, which account for about 10 percent of the nonmetro population. These communities are heavily concentrated in the Southeast. They have had chronically low income over several decades, low population density, and contain disproportionate numbers of disadvantaged persons with limited potential for laborforce participation. Peggy J. Ross, "The Changing Landscape of Rural America: Implications for Policy and Planning," *Looking Ahead*, Spring 1986, pp. 6-11. Along with the persistent poverty counties, nonmetro counties that are dominated by Federal lands, or by single extraction industries, such as agriculture and mining, also have poor opportunities for development. About half the nonmetro counties and their population fit into these categories. Thus, severe development problems face between 10 and 50 percent of rural America.

[66] Much of Third World development efforts and literature are directed toward such circumstances. For further reading, see Jameson and Wilber, op. cit., footnote 3. Gerald M. Meier (ed.), *Leading Issues in Economic Development*, 5th ed., (New York, NY: Oxford University Press, 1989).

[67] Jonathon Sher, *Education in Rural America: A Reassessment of Conventional Wisdom* (Boulder, CO: Westview Press, 1977).

[68] Ibid. For such communities, a development strategy that fails to recognize the role of outside assistance ignores the fact that these communities exist in a larger regional, national, and global context. Factors and trends outside the community have often imposed obstacles and constraints to the degree that the community can not spontaneously act of its own accord. Addressing this problem, Kenneth Wilkinson cautions against development strategies that "blame the victim" in demanding that rural communities solve their own problems. Wilkinson, 1986, op. cit., footnote 28, p. 9. At the same time, however, Wilkinson also stresses the importance of local actors and community involvement in achieving a development process that is lasting and meaningful.

Job training is important to overcoming the obstacle of a poorly or inappropriately skilled local laborforce.[69] Many Federal training efforts in this arena are administered by the Department of Labor.[70] Vocational education, work experience programs, and cooperative extension reinforce human resource training in rural areas, targeting young workers in particular. In addition to training, programs that enable workers to leave the home to work are often crucial. Often workers lack personal resources such as childcare, transportation, tools, or clothing needed to seek work.[71]

There is a major role for telecommunications and information technologies in building human resource skills. Experiments in distance learning have produced successful formats and innovative approaches to engage students and achieve educational goals. Many of these programs began as efforts to serve isolated rural students. For example, classes broadcast daily from Norton, VA over satellite and microwave channels enable students in Wise county, in the Appalachian regions of western Virginia, to take college preparatory classes that otherwise would be unavailable in their school district due to its remoteness.[72]

Beyond academic instruction, distance-learning tools could prove valuable for upgrading worker skills and familiarizing students with technology. For example, as part of Mississippi's Star Schools program, Mississippi State University produces teacher training courses in mathematics and science, enabling teachers from rural and disadvantaged communities to build their own skills.[73] These training techniques need not be limited to the education profession. To reap the maximum benefit from technologies in a human resources development strategy, these tools should also be used to bring professional accreditation courses and the like to improve the skills of the professionals in the community.

Photo credit: Sherry Emery

Professor Donald Hanna and Fred Wood in a studio of Washington State University's interactive educational television facility, WHETS, in Pullman.

Telecommunications and information technologies can also improve health-care delivery in rural areas. From online databases that provide physicians with indexed scientific periodicals, to remote defibrillation and monitoring of heart patients, to inventory control systems that link suppliers and hospital administrators, to diagnostic services that connect general practitioners with specialists at research hospitals, communications technologies can provide rural communities with levels of health care now available only in urban centers. These technologies can also help cut costs so that rural hospitals could remain open when they otherwise could not.

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[69] U.S. Congress, Office of Technology Assessment, *Worker Training: Competing in the New International Economy*, OTA-ITE-457 (Washington, DC: U.S. Government Printing Office, September 1990).

[70] Beginning with the Manpower Development and Training Act of 1962, to the Comprehensive Employment and Training Act (CETA) of 1973, and the Job Training Partnership Act of 1983, these programs have focused on skill or specific-job training. The first programs focused on training displaced and unemployed workers, using Federal funds. Later programs have been decentralized, with State and local programs targeted to more particular needs and training goals, and forging stronger links with potential employers. See Sar Levitan, "Helping People with Labor Market Problems: An Overview of Key Policies," *Policy Studies Review*, vol. 6, No. 4, May 1987, pp. 712-721.

[71] Transportation problems are particularly severe for poor persons in remote rural communities. Work is often a long distance from home, and limited public transportation networks almost demand that a person have a car—a barrier to many of the poor.

[72] Lisa Berger, "Beaming Lessons Across Appalachia," *Appalachia*, fall 1989, pp. 23-27. Currently, however, many distance-learning projects target advanced students. Those who lack basic skills might not find suitable curricula among the packaged programs.

[73] U.S. Congress, Offfice of Technology Assessment, *Linking for Learning: A New Course for Education*, OTA-SET-430 (Washington, DC: Government Printing Office, November 1989), p. 29.

These applications will have a greater chance of success if they are part of a comprehensive development strategy. The implementation of technological solutions takes time, money, and knowledge, so small rural hospitals or schools that are already straining to survive might not be able to integrate technology into their strategic planning without some sort of guidance.

Type II Strategies: Building Industrial or Enterprise Capacity

The development of human resource and social infrastructure will not help an unemployed or underemployed rural person if there are few job opportunities in the community. To overcome this obstacle, economic development must also seek to expand employment opportunities.[74] Most economic development strategies presume that communities must increase their productive capacities in order to attract or develop jobs and make their economies self-sustaining. These strategies often attempt to develop a "base" for economic activity.[75]

The basic assumptions of resource development strategies for rural areas are:

- Most areas can support expanded industrial or commercial activity because their resources are currently underutilized.
- Barriers to development include lack of information about the area's resources, inadequate physical facilities, lack of firms, or poor financing.
- The effects of increased business activity will multiply throughout the community; thus the public good is served by having increased economic activity, even at public expense.

Traditional economic development approaches share these same assumptions, however, their narrow business focus sets them apart from an integrated development approach. A Type II approach recognizes when the critical human and political infrastructures are in place, but the community still lacks economic stimuli.[76] A Type II approach is, therefore, consistent with a holistic development approach.

Type II development strategies might include efforts to attract outside firms, or programs to expand and retain existing businesses in the community.[77] A Type II strategy might emphasize local financing projects if access to capital is a barrier to increasing employment in a community.[78] Or a Type II approach might focus on infrastructure development if shortfalls of the local transportation, sanitation, water, electricity, or telecommunications systems are barriers to job growth.[79] When remoteness from markets and market information is a barrier to local employment, market identification and development can play a critical role in a Type II strategy.[80] Often, rural communities have difficulties in finding markets for their products or establishing the institutional ties to develop markets. A promising strategy for business growth in rural areas is an analysis of local spending patterns to determine what types of businesses are not locally available, but which the local market could support. For example, small communities of a certain size tend to have enough business to support a dry cleaners and a hardware store, so communities of that size could encourage the establishment of these businesses.[81] Such strategies tend to provide a better balance between rural and urban areas. Thus, rural citizens spend money in their own community, where it can stimulate further economic activity, rather than in urban centers, where the multiplier effect is lost.

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[74] One popular framework for this type of development is the five "M's". According to this premise, economic development needs Money, Materials, Management, Marketing, and Manpower. See Blakely, op. cit., footnote 20. Other paradigms draw on the interplay between firm creation, expansion, financing, infrastructure, and technological transfer. In many cases the emphasis is to discover the industries that fit the community's resources.See also Barry M. Moriarty, "Industrial Location and the Theory of the Urban Labor Market" (Chapel Hill, NC: University of North Carolina, Department of Geography, 1982), mimeo.

[75] In some cases, this base will be a primary industry or resource, such as agriculture, forestry, or mining. In other cases, a natural resource can provide an attractive site for tourism, trade, or transportation-related services.

[76] Another caution against the traditional development programs is that they tend to redirect regional growth rather than create it. The premise of industrial attraction usually is to attract economic activity that could occur somewhere else—a "beggar-thy-neighbor" approach—rather than to create new economic activity.

[77] With any of these strategies, it is critical that development planners at the local level bear in mind what types of jobs such efforts will bring to the community: jobs that will stay rather than leave for lower wages or tax breaks elsewhere, and jobs that will provide full-time employment that matches the skills of indigenous workers.

[78] Public or private sources could guarantee loans for firms that could afford market rates but due to their rural location could not get financing. A municipality could issue bonds, which would provide money at below market rates to selected economic development projects. Additionally, local efforts could seek out Federal interest rate reduction programs such as the Small Business Administration programs, which are typically administered in State agencies. In many cases, it is lack of information about financing activities that inhibits access to capital in rural areas. For example, small business makes up a larger share of rural employment than in urban areas, and rural banks tend to have limited incentive and capability in dealing with business loans.

The variety of applications of telecommunications and information technologies in business make them an especially attractive component of a Type II strategy. For a community trying to attract outside businesses, a telecommunications service such as New Mexico's "One-Stop-Shop" could be helpful. This program enables small and large businesses to access an online database that provides information about communities across the State.[82] Although this program mainly allows outside businesses to select potential locations within New Mexico, communities could benefit from an analogous database, with information about firms looking to relocate. This could assist in matching the needs of firms with the communities' development criteria.

Communities seeking to develop business from within the community could use communications technologies to directly target markets for local products and services. The Palouse Economic Development Council, working in the interests of four counties in southeast Washington State, has such a project. Using communications technologies, local firms, ranging from a farm equipment vendor to a local computer consulting firm, market their products overseas. In this way, businesses that require a relatively large market can exist and prosper in a community that could not previously support them. In a similar fashion, communications technologies could be used to identify investment capital that is unavailable within the community. For both local and outside businesses, such an application could make an important difference.

The use of communications and information technologies requires various levels of firm, community, and State involvement. If a network or bulletin board existed, perhaps only community or even firm coordination would be necessary to link up. If a system does not exist, concerted action by many players, including telecommunications providers, is needed. Individual firms cannot afford to design and implement such a system since the cost would exceed the benefits to a single firm. If the costs are spread across several businesses, or if a grant provides the initial funding, the combined benefits to firms in the region can justify the costs.[83]

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[79] Specialized infrastructure projects, such as industrial parks, were long heralded as prerequisites for economic development in rural areas. For example Kale and Lonsdale write, "The presence of developed industrial sites or parks will probably become an increasingly important consideration for many industries seeking a nonmetropolitan location. . .Towns without [developed sites] may find themselves automatically excluded from consideration by prospective industries." Steven R. Kale and Richard E. Lonsdale, "Factors Encouraging and Discouraging Plant Location in Nonmetropolitan Areas," Richard E. Lonsdale and H.L. Seyler (eds.), *Nonmetropolitan Industrialization* (Washington, DC: Winston, 1979). Evidence for this point of view is negligible; critics assert that the growth-inducing properties of such projects are a myth. For example, Belzer and Kroll identified 24 industrial parks that had been placed in rural Northern California timber communities. Of these parks, 16 stood totally empty after a decade, and only two, built for lumber mills, were full. Dena Belzer and Cynthia Kroll, *New Jobs for the Timber Region: Economic Diversification for Northern California* (Berkeley, CA: University of California, Institute of Governmental Studies, 1986). There are many accounts of similar developments with similar results.

Infrastructure shortfalls can be important barriers to increasing employment in a rural community. Many rural rail lines and roads are in poor condition, making access to these areas both time consuming and costly. Inadequate water supply and sewage capacity constrain business activity in many rural areas. Whereas most rural residents can use wells and septic tanks or small package plants for sewage treatment, industrial demands are generally too large for such small-scale systems. Federal environmental protection programs, along with Corps of Engineers programs that operated through the 1970s, provided a significant share of funds for the expansion of municipal systems, but these programs have dramatically reduced their funding in recent years. Communities that did not get their systems upgraded when the Federal money and initiative were available will find it difficult to do so now.

[80] For example, in the introduction of the kiwi fruit by California agriculture interests, there was an active interplay between the production interests who planted new acreage and their producers' organization, which conducted extensive marketing efforts to introduce consumers to the new fruit. In another example, rural economic developers have found markets for locally produced agricultural products, manufactured goods, or arts and crafts items, often in foreign countries; a Wisconsin firm developed a way to make chopsticks for an export market; in Washington, Indians started marketing their smoked salmon in major department stores in New York, instead of limiting themselves to the local market.

[81] Such opportunities are identified using a shift-share analysis technique. See Blakely, op. cit., footnote 20.

[82] Included on the database is information about financial resources, labor statistics, site and building locations.

Type III Strategies: Developing Social and Organizational Capacity

In addition to human resources and a vital economy, sustainable development needs an active community structure. A Type III development strategy is needed when a community lacks social and community organizations to motivate citizens, mobilize opportunities, and expand on existing resources. Without community capacity, few locally owned businesses will be created, and the community will have neither the ability nor the will to control its destiny.

Community development projects have evolved through three models.[84] The first model utilized technology transfer to bring modern and sophisticated knowledge and techniques to rural communities,[85] including information about community planning, government administration, and the economy.[86] The second model built on the experience with technology transfer programs, which showed that active social networks were necessary for successful technology transfer to take place. Thus, this model emphasized forming communities into stronger social groups.[87] The third model took community alliances a step further to focus on forging linkages among the active groups, if they already existed. Coordination and mediation among community groups and other institutional players are critical for development. Such strategies usually involve community development organizations and small business programs.

Since the end of the Great Society initiative, community development programs have been substantially cut back. Such programs have never been perceived as being widely successful in rural communities. There have been isolated successes, but the general failure of these programs to meet the needs of rural communities was likely due to the programs' complexities. Eight criteria are associated with successful community development organizations:

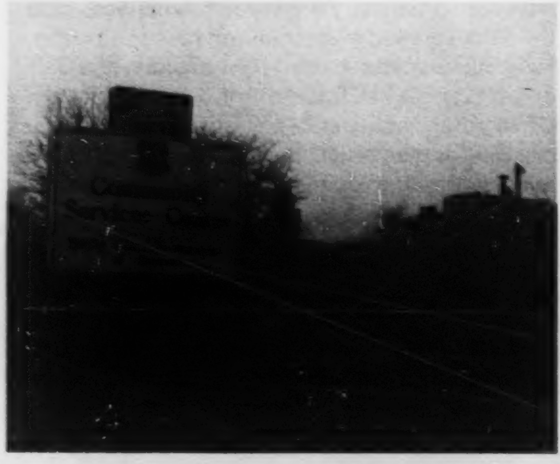

Photo credit: Mark G. Young

The Community Services Center in Warrenton, Virginia undergoes expansion as the area is touched by the metropolitan sprawl of Washington, DC.

1. ample start up money;
2. a base of community support, including influential persons and community groups;
3. clear, specific, and understandable goals;
4. involvement of the intended beneficiaries in the development process from the start;
5. managerial capability;

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[83] Big Sky Telegraph in Montana is an example of such an arrangement. This electronic bulletin board service allows small businesses across the State to communicate with one another and share information about markets and about computer applications (see box 1-E).

[84] Bradshaw and Blakely, op. cit., footnote 54, pp. 137-142.

[85] The strongest tradition in U.S. rural community development came from the agricultural extension programs. In agriculture, it was acknowledged that more efficient agricultural production was often blocked by communities. For example, early research on the diffusion of innovation showed that improved seed or agricultural practices would not be adopted by individual farmers unless some opinion leaders first tried the innovation or gave personal encouragement to local farmers to adopt it. Abbe Moshowitz, "Cooperative Extension: A Functional Model for Technology Transfer and Economic Development in Rural America," contractor report prepared for the Office of Technology Assessment, May 1990.

[86] After World War II, there was so much migration to the cities that many small rural communities lost the basic businesses and governmental services deemed necessary to the continued economic well-being of the people living there. Responding to this trend and the needs of rural citizens, the USDA proposed, in 1956, that rural development and community development be part of the official functions of the Cooperative Extension Service. Bryan Phifer, "History of Community Development in America," *Community Development in America*, James A. Christenson and Jerry W. Robinson, Jr. (Ames, IA: Iowa State University Press, 1980), ch. 2. The Johnson administration added a large number of community development programs as part of the "Great Society" effort.

[87] The mobilization of groups that represent the interests of disadvantaged persons can be important social networks that empower the needy to seek social and economic change and develop self-help strategies.

6. diverse approaches including technical assistance provision, capital formation, human resource development;
7. successes to build on; and
8. dedicated leadership that will persist in their role and learn during the difficult times their organizations go through.[88]

Despite the complexities involved in community development strategies, they can succeed in a variety of forms. Planning departments of local government, federally funded programs such as Farmers Home and Economic Development Administrations, local development corporations, and private groups are also essential. However, these groups typically operate with little knowledge of the other community groups, or the interests and needs of the larger community.

Coordinating local institutions is an important step in the development process. Such efforts are difficult to organize because they require cooperation and planning among several groups from within and outside the community. The difficulties in orchestrating such a strategy are compounded because the effects of community development on economic performance are often indirect and unplanned. Well-organized rural communities can still decline if there are too few jobs or if the economic benefits are isolated. A Type III approach is effective and appropriate only when a weak community structure is the primary obstacle to rural development. Without human resources or economic activity to sustain organizational initiatives, a Type III approach will not work.

Communications and information technologies can play an important role in a Type III development strategy. For example, to the extent that the telephone reinforces a sense of community,[89] it could be valuable for a population in which a strong community and family bond are important cultural characteristics.[90]

More sophisticated technologies would allow the electronic delivery of public assistance programs.[91] Similarly, by streamlining the operations of local agencies, communications and information technologies can strengthen their effectiveness in the community. For example, information technologies can generate budgets, estimate the number of calls, project annual operating costs and annual revenues, and optimize ambulance location(s) in a rural area to minimize response time and/or cost for emergency medical units.[92] Such analyses could be useful to improve many government and community functions. By pooling the needs of several programs, agencies could better afford such a system and would also become aware of each other's activities.

Type IV Strategies: Developing Economic and Community Resources

A Type IV rural development strategy blends the benefits of Type II—business development—and Type III—community development—programs, and overcomes many of the disadvantages of pursuing each alone. Type IV programs are complex to design and to fund. They are also difficult to administer and evaluate, and require the economic development resources of Type II programs as well as the institutional and community capacity of Type III programs as inputs to a successful strategy. Despite these difficulties, Type IV strategies can effectively bring together the necessary ingredients for a self-sustaining and vital community.[93]

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[88] Hubert L. Smith with Susan Hudson-Wilson and Heather Paley, *Non-Agricultural Rural Development: Four Case Studies* (Boston, MA: Boston University, Institute on Employment Policy, August 1980).

[89] Kielbowicz, op. cit., footnote 55.

[90] Sandra M. Armentrout, "Universal Service in the Navajo Nation Now a Possibility with Wireless Digital Access," unpublished paper, 1990. Armentrout explains that the Navajo Nation possesses the cultural characteristics that make community and family bond important. Hence, the telephone plays an important culture-enforcing role.

[91] U.S. Congress, Office of Technology Assessment, *Electronic Delivery of Public Assistance Benefits: Technology Options and Policy Issues*, BP-CIT-47 (Washington, DC: U.S. Government Printing Office, April 1988). Millions of retired persons receive their social security checks in rural locations. Sometimes errors are made and service is delayed, but overall, electronic funds transfer and computerized administration have the potential for improving the administration of social security and other government entitlements programs. But if computerization makes it more difficult for beneficiaries to get information or correct errors, technology could undermine the effectiveness of the programs.

[92] Luther Tweeten, "High Technology in Rural Settings," state-of-the-art paper, Office for Research in High Technology Education, University of Tennessee, 1984, p. 33.

[93] Steven Haberfeld explains, "unless both the material and human/institutional dimensions are addressed simultaneously in community economic development, there will never be a basis for self-sustaining development to break the economic and psychological dependency that exists in these communities." Steven Haberfeld, "Economic Planning in Economically Distressed Communities: The Need to Take a Partisan Perspective," *Economic Development and Law Center Report*, October/December 1981, pp. 7-16.

A Type IV strategy recognizes that rural organizations must learn to build local economies based on their *natural* and *human* resources. A community must identify the public and private resources available to it, and then invest in the missing parts. It must selectively focus on programs and projects that yield the highest return and ensure diversity in the local economy.

Simultaneous development of economic and community resources contrasts with conventional economic development approaches in several ways:

- instead of simply equating more businesses with more jobs, the community should look for firms that build quality jobs that fit the needs and skills of the population;
- instead of building on a single economic sector (e.g., agriculture or manufacturing), build sets of integrated economic activities that bridge economic sectors;
- instead of focusing on physical assets, focus on the quality of the environment that stems from extensive community development activities; and
- instead of focusing on available labor, focus on the ability of the human resource base to expand to meet the needs of growing and changing industries.[94]

This type of development strategy seeks a fit between the economy and the people of the community. It requires community control and participation in the development process. This approach also requires local firms and agencies to participate as partners in managing the community.

The Community Development Corps (CDCs) that evolved from the War on Poverty provide a useful model. They are locally rooted, with strong representation from the community. They are structured for a variety of activities, such as running for-profit companies, making loans, and obtaining training grants. They pursue a broad agenda of community development and economic growth. The variety of tasks the CDCs perform include:

- using private development techniques for public purposes,
- targeting benefits to communities and individuals in need,
- mobilizing local initiative to address local priorities,
- taking a long-term approach to development,
- linking planning to implementation,
- linking complementary projects within a comprehensive strategy,
- linking public and private sectors, and
- reinvesting resources in the community.[95]

The reduction in Federal funds for such programs has reduced the scope of CDCs, but nevertheless their *functions* are important as guides to a holistic strategy. Even in a changed political environment, CDCs can pursue many effective programs and marshal needed resources.

In addition to CDC development programs, Type IV strategies can take advantage of many other vital community resources. For many communities, the local colleges, hospitals, and other public organizations are the backbone of local employment. For the most part, these organizations are not called on to play an economic development role. Yet, they possess a large and untapped reservoir of talent and resources that can benefit economic development. For example, hospitals have helped start nursing homes, health and recreational facilities, and other health maintenance activities. Hospitals or colleges could also share computer facilities, training facilities, and meeting rooms with local groups. This could help defray some of the institutions' costs and make these resources available to the community. The most extensive involvement for these institutions is to actually become partners in private ventures that will create jobs in the local community.[96]

By taking an integrated approach to development, government programs can attack a larger set of problems. For example, housing programs can be linked to occupational training programs in construction trades, and the county planning department can stimulate development projects that produce local jobs. Waste disposal agencies can establish recycling or energy production projects that might stimulate related industries. Several regional development projects, such as the Tennessee Valley Authority and the Appalachian Regional Commission, provide examples of development integration.

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[94] Blakely, op. cit., footnote 20, pp. 68-70.

[95] Benson F. Roberts, Robert O. Zdenik, and William B. Bivens III, *Community Development Corporations and State Development Policy: Potential for Partnership* (Washington, DC: National Congress for Community Economic Development, December 1980).

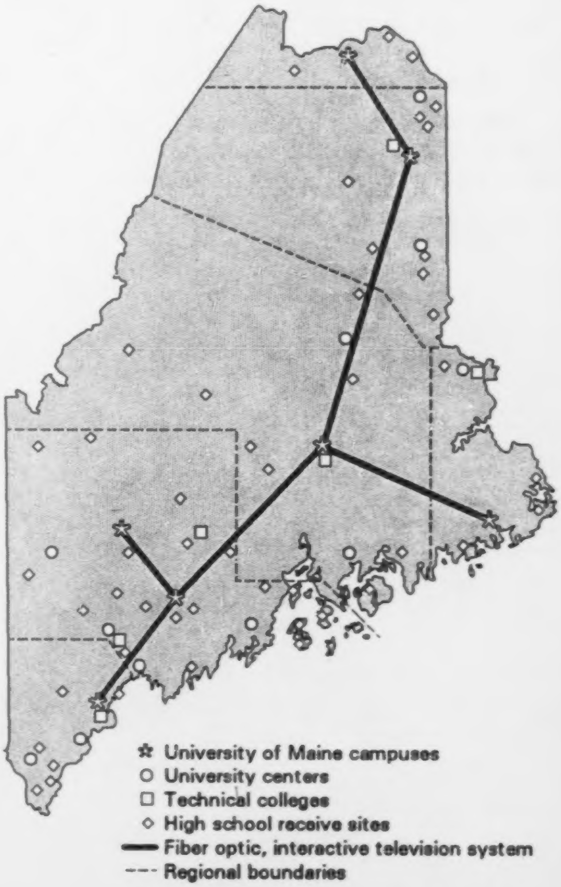
[96] See Ted K. Bradshaw, Bill Myers, and Gary Peterson, "Community Colleges are Job Creation Vehicles in Small Towns," *Small Town*, May-June, 1987, pp. 26-28.

Regardless of the institutional setting, an integrated approach must combine the interests and resources of several groups. This approach builds on the best of the other strategies; it relies on trained individuals, whose basic needs are provided; it builds strong economies from strong communities and ensures that the benefits accrue to the community, instead of outsiders.

The complexity of Type IV strategies is evidence that there is no shortcut to rural development. Projects are often costly and time consuming, requiring sustained support in order to develop the leadership and the community roots necessary to put the pieces together and generate local jobs. They require extensive planning, coordination, and cooperation, and demand innovation and creative use of scarce resources to accomplish their ends. Therefore, local economic development projects are often at the center of political conflict.

Such strategies are largely unprecedented, so examples of how technologies can be employed are scant. With its statewide university fiber optic network for distance education, Maine's efforts represent one of the first steps in an integrated development strategy.[97] Recognizing that half of the jobs in the State would disappear by 2000, to be replaced by jobs requiring higher levels of education, the University of Maine System saw the need to increase people's access to education.[98] As part of this plan, the University of Maine at Augusta, with a grant from the U.S. Department of Education, provided the front capital that allowed New England Telephone Co. to install fiber optics throughout the State decades before this would have otherwise been economically possible. The University broadcasts courses to remote campuses and high schools across the State (see figure 4-6). The system also allows for special events programming and teleconferencing. For example, the Maine Department of Economic and Community Development uses the University's facilities to conduct monthly teleconferences between Portland and Augusta, eliminating the need for travel; Head Start has used the system to deliver interactive programs on child care training; the

Figure 4-6—The Community College of Maine


☆ University of Maine campuses
○ University centers
☐ Technical colleges
◇ High school receive sites
━ Fiber optic, interactive television system
--- Regional boundaries

The backbone of the Community College of Maine's Interactive Television System is the University of Maine System's seven branch campuses that are linked by high-capacity, fiber-optic, digitally switched lines. Specially equipped electronic classrooms permit interactive classes (both audio and video) at multiple sites. In addition, the 6 technical colleges, 11 university centers, and about 50 high schools serve as receive sites for the transmission of interactive secondary and postsecondary courses. The live classes are transmitted throughout the State by microwave. Each receiver site is equipped with a television, a VHS/VCR and cordless phone for students to communicate with the teacher and students in the other classrooms. In its first year in operation, 36 courses were transmitted to more than 2,500 students at 47 locations.

SOURCE: The Community College of Maine, *Annual Report: Year One 1989-1990*, Office of Distance Learning, University of Maine at Augusta.

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[97] Indiana and Michigan have plans for similar networks.

[98] Office of Distance Education, University of Maine at Augusta, *Annual Report: Year One*, 1990.

Maine Municipal Association broadcast a four-way interactive program that explained the changes in laws affecting municipalities in 1990; and Lotto America broadcast presentations introducing lottery agents to Lotto America, using 42 of the system's remote sites.[99]

The case of Maine illustrates how institutions can and must work together in order to orchestrate an integrated development plan and to employ communications and information technologies as part of such a plan. Although the University administers the system, there is a symbiotic relationship among the many uses and users of the system. This type of relationship makes the system viable. Without the agglomeration of users, the deployment of DS-3[100] capacity would be economically infeasible; yet it is the broadband capacity that makes the system useful for so many purposes.

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[99] Ibid.

[100] DS-3 lines have a capacity of 45 megabits. This compares to the more common T-1 line, which has a capacity of 1.5 megabits. For more detailed information, see ch. 3.

Chapter 5

Regulation and Rural Development

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Chapter 5

Regulation and Rural Development

Findings

Telecommunications regulation has greatly affected the extent to which rural areas gained access to telecommunications in the past. Despite deregulation, regulatory decisions will continue to determine whether rural areas have access to advanced telecommunications and, hence, whether they can participate fully in the global marketplace.

The small populations and large distances of rural regions are incompatible with the economies of scale that characterize many aspects of telecommunications. As a result, market forces, absent regulatory mandates and incentives, rarely work to benefit rural areas. Current regulatory approaches do not bridge the gap between market forces and the technology needs of rural areas.

Regulators[1] must develop new regulatory approaches for rural areas. The communications infrastructure provides socioeconomic benefits that must be incorporated into their cost-benefit analyses. Similarly, the indirect costs of distance-sensitive pricing practices such as interLATA and interexchange toll charges, which make communications more expensive for rural citizens, must be evaluated in this context. Regulation must also encourage communities and telecommunications providers to find new ways to create economies of scale and scope, making the deployment of advanced communications technologies to rural areas financially feasible.

Introduction

The conflicts between economic development goals and regulatory goals stand out in rural areas. From an economic development perspective, communications is a means to a larger end. The current regulatory climate, however, views communications narrowly, as a commodity to be bought and sold. As such, it is an end in itself. Urban areas, with many independent users who can create their own private communications networks and afford the costs of interconnection, can adjust to and benefit from such regulatory policy. In rural areas, however, this is not the case. It is more costly to deploy technologies in remote areas, and there are fewer users to share these costs. Therefore, if the infrastructure evolves by market forces to meet the needs of dispersed individuals in rural areas, it will be uneven and service quality will vary.[2]

It is important for policymakers to consider both the commodity and infrastructure characteristics of communications technologies in determining their role in rural development. While focusing on communications as a commodity may lead to inadequate infrastructure in rural areas, treating all infrastructure development in a uniform manner could waste resources.

Communications can help arrest the decline of rural areas, so it is imperative to balance rural economic development and regulatory goals. Currently, little is being done to achieve this. Regulators rarely consider multifaceted economic development goals when making regulatory policy. On the other hand, educators, health officials, and local government are often unaware of what is at stake for them in the regulatory process.

Regulatory Implications for Economic Development

Technology Diffusion and Network Modernization

Economic and technological trends are changing the global economy and transforming rural economies, forcing them into the information age. The speed with which rural areas will gain access to the advanced technologies, allowing them to participate in the information economy, will be determined largely by the regulation or deregulation of communications and information.

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[1] Along with the State legislators and the courts, who determine the scope of regulators' authority.

[2] An unevenly developed network has several important implications. As the technological sophistication of the public switched network increases, the potential for geographical disparity of service also increases. A danger is that the network will continue to evolve, but with different standards of service depending on the power a region or community can leverage in the telecommunications marketplace. Even under the unified Bell System, the network evolved unevenly. As a result, locations exist in rural areas where there is no telephone service, while other remote locations that are able, like most urban regions, to generate enough demand or command public service commission attention have relatively sophisticated communications.

During the era of the Bell monopoly,[3] regulation encouraged subsidized service to rural areas from the excess revenues earned in densely populated areas. This is no longer the case. Nonetheless, the partially competitive post-divestiture climate encouraged alternative providers, such as digital radio carriers, to enter the communications market with innovative products that can improve service in rural areas.

Rate regulation critically affects network modernization and technology deployment in rural areas. In many areas, rate-of-return regulation is giving way to price-cap regulation and the impact on rural areas is uncertain. In addition, other forms of regulation, including depreciation rates and the cable/telco cross-ownership ban, also impact rural network modernization.

Rate-of-Return Regulation

Until recently, both National and State regulators almost exclusively used rate-of-return regulation for the telecommunications industry. Under rate of return, regulators determine the total revenue a firm requires to provide service. This *revenue requirement* includes operating expenses, depreciation and taxes, and a "fair" return on its *rate base*. The rate base consists of the total of the firm's invested capital, including switching, transmission, and distribution facilities.

A number of subtleties of rate-of-return regulation affect the incentives to improve the network facilities and to extend service to rural areas. These factors involve how regulation treats the firm's costs and how these costs affect the consumers' prices. First, regulators can allow or disallow modernization costs in the rate base. If these costs are allowed, the rate base increases and the firm must raise more money from its subscribers through higher rates to generate the prescribed rate of return. If the costs are disallowed, then new equipment does not become part of the rate base and the company may not be willing or able to invest in plant equipment for which consumers do not directly pay. In this case, modernization likely occurs more slowly. Regulators must strike a balance between technological sophistication and the cost to the consumer.

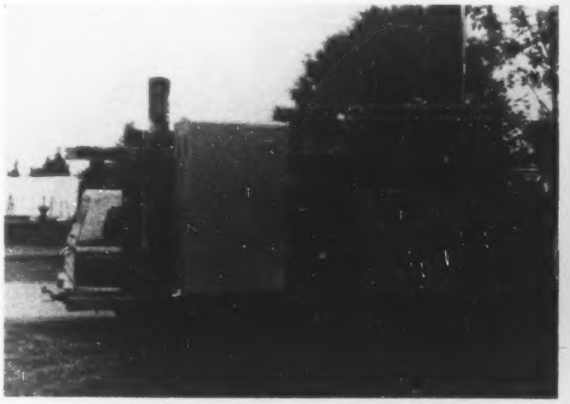

Photo credit: Mark G. Young

A "Slick-96" host-remote switch in Houlton, ME. This remote digital switching unit improves the quality of transmission for rural residents because their calls no longer necessarily have to travel the many miles, along which the signals get attenuated, to the central office switch in a larger town.

Regulators also determine how costs are split between consumer groups, such as residential and business. Businesses usually pay more than their proportional share of the costs so that residential consumers can pay lower prices. Similarly, urban areas historically have paid more than their share of the costs to subsidize rural services.

Many inefficiencies are attributed to rate of return regulation,[4] but two problems are particularly relevant to network modernization and technology diffusion to rural areas. First, regulators must rely on cost forecasts and data provided by the firms they regulate to determine the revenue requirement. The allocation and justification of costs determine the prices consumers are charged and affect the firm's rate of return. Hence, there are incentives to misreport costs. Regulators must be wary that a firm could report cost estimates higher than its actual costs, charge customers higher prices, and thus earn a higher return. However, regulators must also be concerned about revenue short-falls caused by faulty cost estimates. If a firm's costs significantly exceed the estimated costs, resulting in a lower than prescribed rate of return, the firm might not be able to afford modernization costs. Although there is no guarantee that the company will recover its entire revenue requirement, on average the company will earn close to a market return on its investment.[5]

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[3] As ch. 3 describes, the present regulatory structures still allow for subsidies to high-cost regions, but the nature and extent of these subsidies have diminished since the divestiture of AT&T and the growth of a partially competitive telecommunications market. If the telecommunications industry evolves, as many believe it will, toward an even more competitive structure, the system of subsidies that benefits rural communities could become further eroded, either forcing the consumers to pay higher rates than their urban counterparts for comparable service, or implying that rural telephone companies might not be able to invest enough in their facilities to maintain adequate service—service comparable to that in urban areas.

[4] Ronald R. Braeutigam and John C. Panzar, "Diversification Incentives Under 'Price Caps' and 'Cost Based' Regulation," *Rand Journal of Economics*, vol. 20, No. 3, autumn 1989, p. 390.

Second, some believe consumers face higher prices because rate of return can induce firms to overinvest in capital.[6] Because the amount of a firm's return is directly proportional to the size of its rate base, the firm might seek to expand its rate base by investing in more technology than would be economically warranted without the regulatory incentive.[7] Such investments can be wasteful because consumers pay higher rates for unneeded technologies.

In addition to making the rate base larger, over-capitalization can increase revenues in other ways. In the past, the separations and settlements[8] process affected the relative costs of modernizing different parts of the local network. Since a local exchange carrier's (LEC) share of pooled nontraffic-sensitive (NTS) costs determined its share of the settlements pool, there was incentive for overinvestment in certain facilities. Recently, the LECs' desire to insulate themselves from competitive pressures may have led them to invest in technologies that raise entry barriers or lower their own costs at strategic points in the network. However, it is difficult to prove that these are anticompetitive practices, and there are no reliable empirical studies supporting this hypothesis.

To safeguard against over-capitalization, firms must gain regulatory approval to make large capital investments. Regulators determine whether demand for the proposed technology exists in the local community before it is approved. This process requires the community and regulators to understand the potential and capabilities of telecommunications to improve community life. Rarely does such an understanding exist, either in the local community or in the regulatory bodies.[9] Thus, the regulators' efforts at consumer protection can work against the consumers' broader interests.

Industry observers question whether rate-of-return regulation actually produces incentives for the firm to overinvest in capital. They contend that the many assumptions—about the regulated firm, the industry, and the regulatory agency—needed for the method to function make it ill-suited for the telecommunications industry.[10]

As the telecommunications industry becomes more competitive, the effects of rate-of-return regulation become more complicated. With more private networks, the costs of completing calls between the shared public network and private networks could rise because fewer customers are sharing the costs on the public network. This trend could affect how much subscribers to the public network must pay and the extent to which they can enjoy advanced technologies. In some situations, rate-of-return regulation can reduce incentives for efficiency and innovation, and result in higher costs than with alternative regulatory approaches. For example, why should a firm undertake a risky modernization program if consumers immediately benefit from any cost savings resulting from innovation, but investors must bear the risk of regulatory disallowances and losses from unsuccessful innovations. Such asymmetric regulation can result in higher costs to the rate payers, delay modernization of the country's infrastructure, deny customers access to new and innovative services, and compromise the competitiveness of regulated firms in the marketplace.

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[5] Sanford Berg, "Regulatory Structures and the Deployment of Information Technologies in Rural Areas," contractor report prepared for the Office of Technology Assessment, June 1990.

[6] Breutigam and Panzar, op. cit., footnote 4. As part of the overinvestment, firms might choose inefficient technologies or undertake cost-reducing innovation in an inefficient way. For example, a cost-reduction innovation could require more labor input, but the firm would substitute more expensive technology for the labor in order to increase the rate base.

[7] Averch and Johnson first identified this tendency in 1962, in their seminal piece, "Behavior of the Firm Under Regulatory Constraint," *American Economic Review*, vol. 52, pp. 1052-1069.

[8] As John T. Wenders explains, the separations and settlements process is extremely complicated: "[i]t is a full-employment act for accountants. . . *Separations* simply refer to the policy of separating both the traffic and nontraffic sensitive portions of local *accounting* costs into two parts: One part remains in the state jurisdiction in which the exchange is located, and the other part is assigned to the interstate arena under the jurisdiction of the Federal Communications Commission (FCC) where these costs are added to the cost of providing interstate toll services." John T. Wenders, *The Economics of Telecommunications: Theory and Policy* (Cambridge, MA: Ballinger Publishing, 1987), p. 2. This process was an integral aspect of the rate averaging between high-cost and low-cost service areas, which benefited rural areas because of their high cost of service.

[9] Ch. 4 describes how the lack of information about and understanding of the role of information technologies in community and economic development serves as a barrier to rural economic development. Even if rural communities gain access to sophisticated technologies, lack of understanding of their capabilities will persist as a barrier unless some form of technology transfer and education is part of a larger development plan.

[10] Brooks B. Albery and Mark P. Sievers, "The Averch-Johnson-Wellisz Model and the Telecommunications Industry," *The Federal Communications Law Journal*, vol. 40, No. 2, April 1988, pp. 157-192. Brooks and Sievers list 12 assumptions of the Averch-Johnson Model, 6 about the firm and 6 about regulation. About the firm: 1) the firm chooses inputs so as to maximize profit; 2) the firm's profit maximizing revenues are greater than its revenue requirements as set by the regulator; 3) the cost of capital (r) is constant and is set in a perfectly competitive environment; 4) inputs are perfect substitutes; there are no constraints on inputs employed; and inputs display diminishing marginal returns; 5) demand for the firm's product or service is fixed; 6) the firm has no competitors. About regulation: 1) the allowed rate of return is set greater than the firm's true cost of capital (r); 2) revenue requirement adjustments occur instantaneously; 3) the only regulatory tool used by the regulator is the allowed rate of return; 4) the firm is constrained by only one regulator; 5) cost minimization (economic efficiency) is the only goal of regulation; 6) all parties possess perfect information.

Regulators must be aware of potentially anticompetitive practices by regulated firms. Well-heeled firms could subsidize a competitively offered service long enough to force out their competition. This could effectively foreclose unregulated providers from offering a competitive service, potentially slowing the rate at which rural areas could gain access to new technologies. Yet, excluding regulated firms from competitive markets could deny consumers lower prices, and deny investors of opportunities to take advantage of new markets.[11]

The effects of regulation on network modernization are complex and generalizations cannot be made. Since incentives for innovation and network modernization are central to economic development, it is important that the implications of rate of return regulation be considered in the context of economic development. When communications is viewed as an infrastructure, necessary for a variety of social and economic functions, the regulator's dilemma of allocating costs gains a different perspective.

Regulators must consider the costs to society and also to the individual subscriber, if the community cannot link up with the rest of the world. If the local hardware store cannot exchange data with the larger national franchise, it may not be able to remain in business. If the school cannot access library information services or video courses, the community suffers in the short and long term. Similarly, regulators must also consider the value of the range of applications of information technologies within a community. Telecommunications access to state-of-the-art medical technologies, international markets, and distance learning curricula is more valuable to a community than merely the ability to make routine telephone calls. The effects of rate of return regulation could be very different if regulators calculated the costs and benefits of network modernization and technology for economic development.

Depreciation Practices and Modernization

The rate at which a company depreciates its capital investments affects the rate at which it can modernize its facilities.[12] A long depreciation schedule can imply a slower modernization process because the cost of equipment must be spread over a long period of time. In this case, a firm could not afford to make new investments as quickly, but subscribers' rates could remain low. A short depreciation schedule recovers the cost of an investment over a short time, and the consumer absorbs this with higher rates. Because the firm recovers the cost of the investment quickly, it can afford to make new investments sooner. In addition, the shorter payback period means that the company will pay less interest on the loan, and therefore the total cost of the equipment will be less. Thus, although the higher cost is passed to consumers, they ultimately pay less for that technology.[13]

Historically, rural independent telephone companies have faced relatively long depreciation rates. Rather than replace their equipment with new technologies before the old equipment was fully depreciated, most companies continued to use electromechanical switches while urban areas installed analog electronic switches. Technology advances have occurred rapidly in recent years, so digital electronic switches have replaced analog electronic switches as the preferred technology. At the same time, the electromechanical equipment in some rural areas was fully depreciated, enabling telephone companies in rural areas to purchase digital switches —essentially leap-frogging a level of technology. As a result, many rural areas have digital switching before their urban counterparts. Nonetheless, the majority of rural areas are still behind urban areas in terms of technology.

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[11] Some analysts call for "residual pricing" of core services, using revenues from new services with market-based prices to cover a portion of shared costs. However, the share covered by new services would not be based on some arbitrary "fully allocated cost," but on what the market dictates.

[12] The links between depreciation practices and modernization are clear in theory, although quantitative studies are unavailable. One of the few empirical studies in this area found that higher realized rates of return lead to greater investments in plant modernization by AT&T in the 1960s and 1970s. B. Branch, "Quality of Service and the Allowed Rate of Return: American Telephone and Telegraph," *Journal of Economics and Business*, vol. 32, 1979, pp. 86-98.

[13] Strictly speaking, this ignores the opportunity cost to the consumer of the extra money they will pay for a shorter period of time. Consumers will pay less for the technology assuming that the telephone company cannot earn a higher return on the extra amount of money it would be paying on the shorter depreciation schedule if it invested that money elsewhere and paid the utility over a longer depreciation schedule.

If regulators allow fast depreciation schedules, a telephone company might modernize its network more quickly. However, regulators must consider the value of the sophisticated equipment in light of the higher rates consumers must pay. Although industry observers, regulators, and communications companies continue to debate how sophisticated the technology needs to be for the average consumer, the scope of the debate and the range and number of those debating are limited. When such debate occurs, it often focuses on the residential users' needs. If, however, communications is viewed as an infrastructure, simultaneously supporting multiple functions, the community's need for advanced technology is much greater.

In determining an appropriate depreciation rate, regulators must balance not only the firm's financial needs, the effects on consumers' rates, and the expected life of the equipment, but also the level of technological sophistication needed by the community. This requires accurate technology forecasting as well as accurate accounting.

Alternatives to Rate-of-Return Regulation

Price-cap regulation is designed to overcome some of the negative aspects of rate-of-return regulation. This alternative approach sets a price based on the firm's costs for a designated group of services. The set price changes over time, based on inflation, improvements in productivity, and changes in the prices of inputs.[14] By regulating prices rather than the costs of physical inputs, price caps create an incentive for firms to innovate in order to reduce costs and improve their efficiency.[15] Advocates of this form of regulation argue that investors may face greater risks, but the reward structure is more symmetrical (see box 5-A).[16]

Enthusiasm about price caps must be tempered by a recognition of implementation difficulties. Regulators, for example, must consider what price levels are appropriate as a starting point, what productivity index should be used to partially offset inflation adjustments, what items should be in the regulated bundle and what items should be unregulated, the extent to which the firm could cross-subsidize its regulated services with the revenues from its deregulated services, the time period for such a plan, what interval is appropriate for reassessing the price-cap approach, and under what conditions and by what criteria to reevaluate the results of price caps.

In addition, regulators must also monitor quality of service for all subscribers. A firm with capped prices can potentially discriminate between customers by making concessions to politically powerful consumer groups or more profitable users.[17] Furthermore, the firm may be subject to reregulation: regulators (and legislators) cannot guarantee that they will not intervene again in the future. A reevaluation after a given time period is generally specified in the negotiated price-cap agreement.

Price-cap regulation relies on competitive incentives for firms to undertake efficient and innovative activities. This type of regulation could leave rural

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[14] Usually the price is set according to a formula, such as $P_{T+1} = P_T + I — X$, where P_{T+1} is the allowed price, which is equal to P_T, the price in the previous time period, adjusted for inflation, I, and minus a given amount X, which accounts for increases in the firm's productivity that should lower its costs.

[15] Breutigam and Panzar argue that, "at least in principle, [price-cap regulation] can induce the firm to minimize costs, produce efficiently in noncore markets, undertake cost reducing innovation as an unregulated firm would and diversify into a noncore market if and only if diversification is efficient. Incentives to misreport cost allocations and choose an inefficient technology simply disappear." Breutigam and Panzar, op. cit., footnote 4, p. 390. Additionally, Cabral and Riordan (1989) find that incentives for innovation are greater under a price-cap system. L.M.B. Cabral and M.H. Riordan, "Incentives for Cost Reduction Under Price Cap Regulation," *Journal of Regulatory Economics*, vol. 1, 1989, pp. 93-102.

[16] Many believe that price-cap regulation also leads to better regulatory oversight because regulators can focus directly on the policy issues of concern, rather than on detailed historical data, such as historic costs or depreciation expense, which can clutter regulatory proceedings—diverting attention from how utility activity affects the telecommunications industry.

[17] Many regulators and economists believe that price caps create incentives for firms to discriminate in such a way.

Box 5-A—Experimenting With Price Caps

Several States and the Federal Communication Commission have begun to experiment with price-cap regulation. At the State level, public utilities commissions (PUCs) have undertaken price-cap regulation as part of a technology deployment and economic development strategy. For example, in Vermont—a predominantly rural State—the PUC granted greater pricing flexibility to the local exchange carrier (LECs) in exchange for a commitment from the telephone companies to upgrade their technology and provide a basic level of service to every community. Kansas recently took a similar approach. Under the TeleKansas plan, Southwestern Bell agreed to invest $160 million in network technology at a faster rate than it would have under the traditional rate of return regulation. In exchange for Southwestern Bell's commitment, the Kansas Corp. Commission agreed to more flexible pricing regulation. A number of other States are also taking similar approaches.

At the Federal level, the local exchange carriers have received price caps with ambivalence. Although all seven of the Bell operating companies face mandatory price-cap regulation, the majority of independent telephone companies have yet to yield to the new regulatory regime. Meeting the required productivity increases appears to have discouraged some of the smaller telephone companies.[1]

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[1] "Independents Snub Telco Price Caps," *Telephony*, Nov. 16, 1990, p. 20. See also, "Price Caps? No Thanks," *Communications Week*, Nov. 12, 1990, p. 12.

areas vulnerable.[18] Rural areas have traditionally been among the last to get new technologies precisely because firms will maximize profits by serving the least expensive, most lucrative, and easiest-to-serve customers first. Analysts have little hard evidence about how price caps would affect rural areas because these plans have not been in effect until recently, or have been implemented only in limited cases, mostly for competitive long-distance service. If the regulatory flexibility of price caps promotes beneficial technical change, firms and customers, including those in rural areas, could realize substantial savings (see box 5-B).

An analysis of the positive and negative incentives of price caps would be incomplete if costs are viewed strictly as the cost of the firm's investments. Communications technologies are much more than a commodity, especially for rural areas, so regulators should treat investments in communications technologies as investments in community infrastructure.[19] Price caps alone cannot accomplish this. Even if regulators implement a social contract, mandating investments that firms would not make otherwise as a condition of allowing price-cap regulation, regulators and firms must identify the costs and benefits they will be working with, the source of funds, and the means to evaluate these investments. Will the cash flows come from cost savings induced by the new regulatory incentives? Will the financial markets view the new social contract as involving net benefits to investors? Will prices in urban areas be kept artificially higher—providing subsidies for rural customers? Depending on the answers to such questions, rural areas could benefit or lose.

Interestingly, in those cases where States have adopted price caps under the condition that the telephone company make specific investments, the funds for those investments do not come solely from productivity increases. Rather, urban consumers' or business rates are allowed to rise to compensate for the increased investments in the network. Cross-subsidization between urban and rural areas, therefore, persists.

Cable Television

The possibility of one company providing both cable television and telephone service could have significant impact on the rate of network moderniza-

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[18] Even urban areas and large business users can be vulnerable to some of the abuses that can arise from price-cap regulation. In markets without effective competition, telecommunications companies will face greater incentives to maximize profits by *not* improving service. This experience has been the case in the United Kingdom, where price caps have been in place the longest. A Citibank executive notes, "for longer-haul long distance service, . . .price caps have kept rates down because of the fierce rivalry between British Telecom plc and Mercury Communications Ltd.," but for less competitive markets, such as local service and medium-distance toll service, Citibank "has faced escalating rates." Kathleen Killette, "Price Caps Criticized," *Communications Week*, July 16, 1990, p. 12.

[19] In many cases, regulators are constrained by State law and court precedents in the extent to which they can consider economic development concerns.

Box 5-B—Price Caps With Rural Provisions

Utah's Public Service Commission recently adopted price-cap regulations for the Bell operating company serving the State. Under the new plan, US West is granted greater pricing flexibility in exchange for their commitment to invest over $6 billion to upgrade their service to the rural regions in the State. However, as a result of the new plan, residents of Salt Lake will likely pay higher rates.

tion and technology deployment in rural areas.[20] Economically and technologically, such an arrangement is not only possible, but also advantageous for rural areas. Economies of scale exist for both telephone lines and cable television lines in rural areas and therefore, each is a natural monopoly in a rural setting.[21] Both telephone lines and cable television lines can carry digital information. Thus, entertainment video as well as voice and data messages could easily travel along the same lines. This capability will grow as fiber optics, or other high-capacity transmission media, are adopted for cable and for telephone lines. Because it is so expensive to lay the wires for cable television, telephone, and other telecommunications services across vast distances in rural areas, combining all modes of traffic along one conduit could enable rural areas to take advantage of economies of scope and thus more easily and quickly afford a sophisticated communications infrastructure.

Photo credit: Mark G. Young

A cable television satellite-receiver and microwave-transmission site in rural Virginia.

Despite the potential advantages of jointly providing services in rural areas, such an arrangement raises important public policy issues. Legal and regulatory barriers against this type of facilities-sharing have been devised to protect consumers against possible monopoly abuses that could arise from one firm controlling the only lines of communication and information. Action to change these restrictions will be hotly contested because the stakes are very high for both the cable and the telecommunications industries.[22]

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[20] As Robert M. Pepper explains, "whether or not telephone companies provide video programming may not make a significant difference to *whether* LEC's eventually deploy fiber but may significantly affect the *timing* of such deployment" [emphasis added]. Robert M. Pepper, Office of Plans and Policy, Federal Communications Commission, "Through the Looking Glass: Integrated Broadband Networks, Regulatory Policy, and Institutional Change," 1988, p. 16.

[21] One reason that AT&T was divested in 1984 was that people had begun decades earlier to question the natural monopoly characteristics of the telecommunications industry. In urban areas, telecommunications may not, in fact, be a natural monopoly; the size of the subscriber base, combined with the density of subscribers, may mean that several firms might be able to achieve the requisite economies of scale. In rural areas, however, this is not the case. For further reading about the natural monopoly characteristics of terrestrial telecommunications service in rural areas, see John C. Panzar, "The Continuing Role for Franchise Monopoly in Rural Telephony," *Rural Telecommunications*, summer 1987, pp. 43-50. Also, John C. Panzar, testimony for NTIA Notice of Inquiry: Comprehensive Study of the Domestic Telecommunications Infrastructure, Docket No. 91296-9296.

[22] See Roger Noll and Bruce M. Owen, "United States v. AT&T: An Interim Assessment," discussion paper No. 139, presented to the Workshop on Applied Microeconomics, Industrial Organization, and Regulation, Stanford University, Stanford, CA. See also, U.S. Congress, Office of Technology Assessment, *Critical Connections: Communications for the Future*, OTA-CIT-407 (Washington, DC: U.S. Government Printing Office, January 1990). See also "Cable TV Rates, Deployment of Fiber to Rural Homes Debated Before Rep. Wise's Panel, *Telecommunications Reports*, Feb. 12, 1990, pp. 20-21.

Under the 1984 Cable Communications Policy Act,[23] local telephone companies cannot provide video programming within their service areas. By prohibiting telephone companies from providing cable programming either directly (along their own lines) or indirectly (along the lines of an affiliate or subsidiary),[24] the Cable Act effectively created a monopoly for the cable providers in each franchise territory. From a strict economic perspective, two separate transmission lines terminating at each home or business is a wasteful solution.

One rationale for codifying the cable monopoly was to encourage technology diffusion. Policymakers reasoned that a monopoly would deploy technology faster than a competitive market. They feared that, if telephone companies could own cable television facilities, they could discriminate against cable programmers and operators who were not in some way affiliated with the telephone company. Moreover, the telephone company could undercut competitors' prices and drive the competition out of the market. As a result, technology would advance at a slower pace.

Although the cable monopoly persists, policymakers continue to debate whether telephone companies should be banned from the cable industry. The focus of the debate has shifted from the question of technology diffusion to that of market power. Some analysts believe that the cable industry has abused its monopoly position and should be subject to the discipline of a competitive market that would include telephone companies. Others contend that the telephone companies are already so large and powerful that they could easily purchase existing cable systems and thwart any real competition.

In some rural areas, the cable-telephone cross-ownership debate has been resolved. The Cable Act includes an exemption from the rules for towns with populations under 2,500. Congress is now considering expanding the current Federal Communications Commission (FCC) definition of rural area from population of 2,500 to 20,000, so that many more rural locations would be exempt from cross-ownership restrictions.[25] This action represents a first step in recognizing the unique problems of rural areas and addressing rural issues differently from urban issues.

Photo credit: Mark G. Young

A cable company and telephone company in rural West Virginia share the same premises but maintain separate transmission facilities and completely separate ownership structures.

Information Services

The rationale for allowing telephone companies to offer information services, such as videotex, electronic yellow-pages, dial-up video, and cable television is similar to the rationale for allowing cable-telephone company cross-ownership. Such an arrangement could take advantage of economies of scope, by utilizing the same facilities for several different functions, and economies of scale, by attracting the demand of several different user groups. The Bell operating companies (BOCs) argue that such an increase in the demand for network capacity would be necessary to justify rapid, high-capacity network modernization. Before this could occur, however, the provisions of the court-supervised Modified Final Judgment that prohibits the BOCs from offering information services would have to change.[26] This ban exists to prevent the Bell companies from acting in an anticompetitive way that could slow technology diffusion and industry innovation, and could make consumers ultimately pay higher rates.[27] [28] In addition, some critics contend that the information-services ban should remain in place because it would be dangerous for one company to control all the information to each household.

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[23] 47 U.S.C. § 533 (b).

[24] Pepper, op. cit., footnote 20, p. 21. The Cable Communications Act of 1984 prohibits any relationship between a cable operator and a telephone company, other than that of carrier-user. This means that the telephone company may provide the cable company with telephone service, but there can be no other relationship, whereby the telephone company would provide capacity for the cable company to transmit its signals along. Additionally, there can be no financial affiliations between the two parties.

[25] S.20800, of the 101st Congress, included provisions to expand the definition of a rural area from 2,500 people to 20,000 for the purposes of a cable-telco cross-ownership waiver. Although this legislation did not pass, it is expected to re-emerge in future sessions of Congress as an important issue.

As a way to allow the telephone companies to offer information services, the FCC and several State regulatory agencies[29] have proposed a system of Open Network Architecture (ONA).[30] With ONA, enhanced service providers could gain equal access to the telephone companies' networks. Thus, the telephone companies could offer information services under the condition that they open their network to competitors, who would pay for the technology that they needed to reach potential customers. Hypothetically, ONA would create a "level playing field" whereby a BOC could not use its network to discriminate against competing enhanced services vendors who rely on the local network.[31] Such an arrangement would take advantage of the economies of scope while also taking advantage of competitive forces.

Network unbundling, which is implicit in ONA plans, could create incentives for faster network modernization and technology diffusion, but it could also place rural America at a further disadvantage relative to the rest of the country. If rural areas are not able to configure the various pieces of the network, they will not be able to effectively use communications as a component of their economic development plans.

Affordable Technologies Necessary for Economic Development

Bridging the technological gap between rural and urban areas is not enough. Modern technologies will be of little value to rural citizens if they cannot afford to use them. Often, because of their remote location, rural citizens must pay more for transactions that are part of economic development and vitality. The extra cost of making a long-distance telephone call to a nearby database that lies across an exchange boundary, or to call the local school in another LATA,[32] is a barrier to economic development. Not only do rural areas need access to technologies that are comparable to those in urban areas, this access must be comparably affordable.

LATA Boundaries

One factor that creates a cost differential between urban and rural areas is the greater frequency of interLATA calling in rural areas. Because LATA boundaries tend to reflect the calling patterns and exchange locations of standard metropolitan statistical areas, most urban subscribers can conduct daily transactions, such as ordering materials for their business, without considering the extra cost of an interLATA call. LATA boundaries often do not match rural calling patterns so well. Whether they must call an adjacent community, or the nearest urban center, rural citizens frequently encounter the extra costs of making an interLATA call (see figure 5-1).

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[26] Cable television service would qualify as an information service.

[27] Many economists and cable industry advocates contend that the BOCs could subsidize their competitive services, which would include cable television if the information service ban were lifted, with revenues from their monopoly local telephone service. In doing so, they would charge their "captive" monopoly customers higher prices and use the extra revenue to compensate for losses they might incur by under-pricing their competitive products. This would then drive out the competition and create a monopoly for all services.

[28] The BOCs and several telecommunications industry and consumer organizations, including the Videotex Industry Association, the U.S. Telephone Association, and Action for Children's Television, issued a joint request to U.S. District Court Judge Harold Greene asking for the lifting of all the restrictions for information services, claiming that there is no evidence that telephone company entry into information-services markets would be anticompetitive. They went so far as to say that such an action would stimulate competition. *Telecommunications Reports*, Aug. 27, 1990, p. 5.

[29] Federal Communications Commission, through Computer Inquiry III, and New York State along with several other State Utilities Commissions have issued comments on ONA.

[30] As the FCC continues to debate ONA, several States have decided to go forward with network unbundling and ONA. Under such a plan, Washington has ordered that the BOC establish separate subsidiaries for its information services and its plain old telephone services.

[31] Kenneth Donow and Lynn McGlynn, "Open Network Architecture: Public Policy for an Evolving Telecommunications Network," contractor report prepared for the Office of Technology Assessment, July 1990, p. 3.

[32] A LATA (Local Access and Transport Area) is comprised of a relatively large number of local exchanges. The term local exchange refers to the geographic area served by the same local switching equipment. Subscribers within a local exchange have telephone numbers with identical three-digit prefixes. LATAs were developed as a result of the divestiture settlement to define geographic areas within which the former Bell operating companies (BOCs) provided telephone service. The settlement allows the BOCs to provide intraLATA service, but it forbids them from providing interLATA telecommunications.

Whether this disparity is unfair is debatable. Many economists argue that the extra costs required for more frequent interLATA calls from rural areas are not necessarily unjust because rural areas have always been subject to more long-distance calls than urban areas.[33] The question of whether or not LATA boundaries are fair may be less important, however, than whether they impinge on development in rural areas. Since LATAs were an artifact of divestiture, they are unlikely to change unless the Modified Final Judgment changes significantly.

Extended Area Service

In addition to the long-distance costs of crossing LATA boundaries, rural citizens face higher costs for calls that cross exchange boundaries. Because small, independent telephone companies often serve rural areas,[34] calls across short distances may require different companies to make the connection. If two firms must interconnect to complete a call, the costs of that call must be allocated between them and thus usually cannot be covered by each company's flat local service rate. Although it crosses relatively short distances, this call is a toll call.

The exchange boundaries that have existed for several decades may not correspond with local economic or political boundaries, so they may seem even more arbitrary than LATA boundaries. Because urban areas are usually served by one large telephone company, urban subscribers do not face these interconnection charges.[35]

Many States have started to implement Extended Area Service (EAS) plans to address rural customers' concerns about paying toll fees for calls that cross short distances.[36] Under such a plan, telephone companies redistribute their costs. For example, consumers might pay an extra $2 on their monthly bill so that they can call the neighboring community without long-distance charges; some consumers never call that community, while others need to call frequently. On average, the extra revenue from the higher flat rate should cover the lost long-distance revenues.[37]

The local exchange carriers' choice of technologies, their network plans, and the state of modernization are important considerations for defining a local calling area for an EAS plan. This is because the costs for each company depends not only on present engineering and cost allocation, but also on future technologies. For example:

> An all-digital, all-glass network would have a significantly superior ability to handle congestion and to reroute traffic. Also, such a system may be largely distance-insensitive because of its handling characteristics capacity.[38]

Thus, future technology plans might make EAS much more feasible. It might be worthwhile, however, to implement EAS earlier rather than later so that consumers who would provide demand for sophisticated technologies in the future would remain in the current calling region.

Future modernization decisions will depend on present definitions or redefinitions of local calling areas, as much as the definitions of the local calling area will depend on technology deployment plans. The economics of telecommunications are such that costs tend to decrease as size of the service area and capacity increases. As a result, the addition of a host-remote switch, the creation of radio networks, or the deployment of high-capacity transmission facilities that could serve more customers at a lower

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[33] Some propose that the complaint of the unfairness of LATA boundaries in rural areas is legitimate under only two circumstances: 1) if their own calling areas were somehow reduced as a result of the divestiture process, or 2) if interLATA rates have risen dramatically due to regulatory policy. This argument follows since rural consumers needed to make long-distance calls for many transactions even prior to divestiture. Additionally, competition in toll markets, which resulted from divestiture, has tended to lower interstate and intrastate long-distance prices.

[34] While the majority of independent telephone companies serve rural areas, most rural areas are still served by the Bell operating companies.

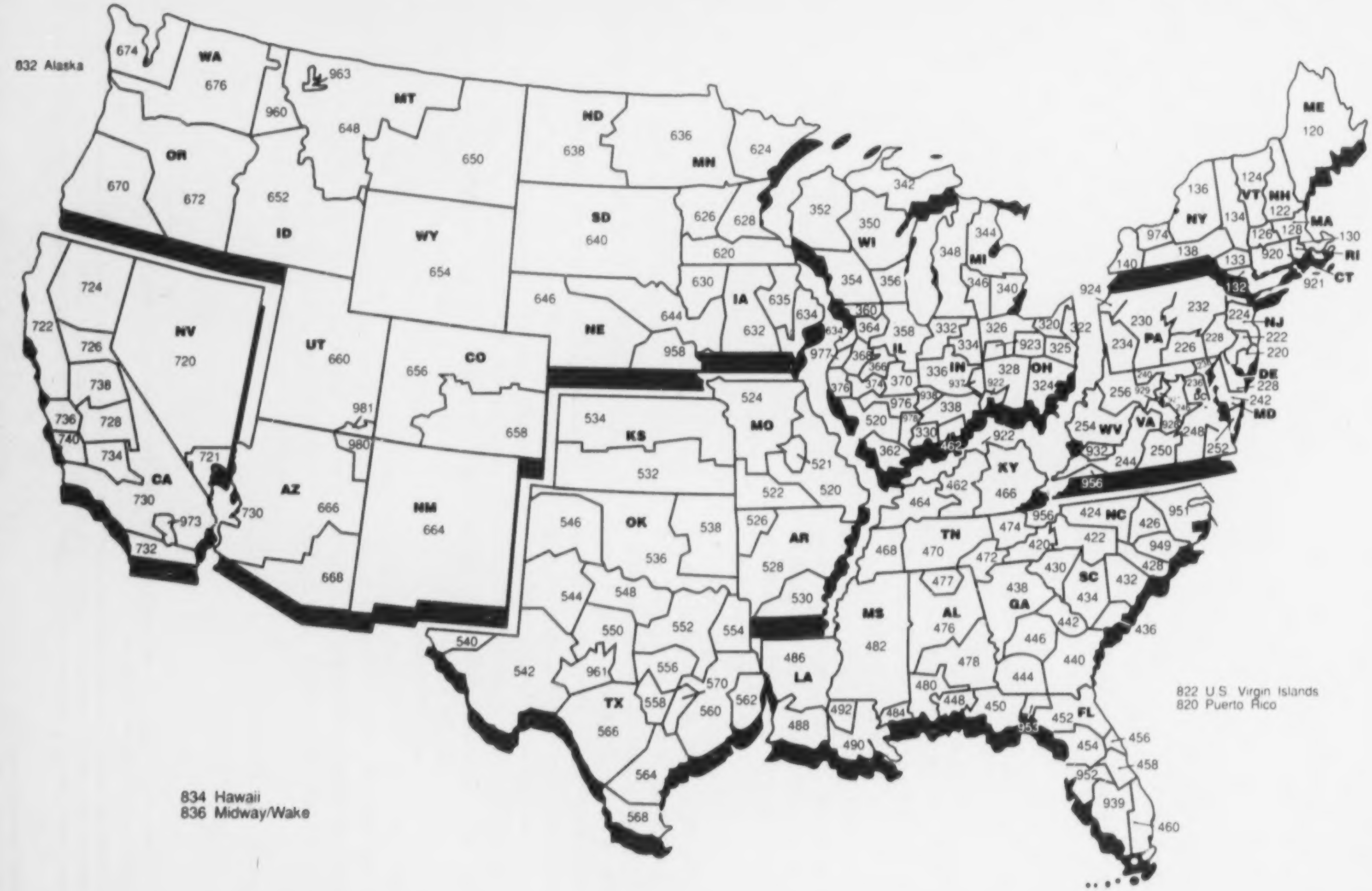
[35] The costs for connecting exchanges within the boundaries of a larger firm are covered by the averaging that occurs with the flat rate for local service in the monthly bill.

[36] Colorado has been very proactive in implementing EAS plans. The rural regions of the State experienced the biggest changes as a result of the new plans because their calling areas were increased significantly.

[37] Although on average firms will make up for the lost long-distance revenues, this average works out because some firms earn fewer revenues and some earn more. States may still have to establish a high-cost fund that would compensate firms who earn lower revenues as a result of the new plan.

[38] Raymond Lawton and John Borrows, *Factors Affecting the Definition of the Local Calling Area: An Assessment of Trends* (Columbus, OH: The National Regulatory Research Institute, 1990), p. 45.

Figure 5-1—National Local Access and Transport Area (LATA) Map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FL
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460
822 U.S. Virgin Islands
820 Puerto Rico
834 Hawaii
836 Midway/Wake

LATA boundaries divide up the country geographically into calling areas, based on usage patterns, but do not correspond to the area code boundaries.

SOURCE: Reprinted with the permission of CCMI, a division of United Communications Group, Rockville, MD, 1991.

cost might seem more feasible if local calling area boundaries expand.[39]

To establish the appropriate EAS boundaries, regulators must first determine the community of interest. Often, they will survey the calling patterns of prospective communities to assess how often they might call a neighboring community. However, the same problems that are involved in forecasting demand for technology exist in forecasting demand for EAS service. If, for example, consumers must pay toll rates to call a nearby community, they might call less frequently and report on the survey few long-distance calls.[40]

Regulators must also consider characteristics of the local communications market when reviewing EAS plans. Three features of the telecommunications market are relevant to EAS.[41] First, whether the local telecommunications provider is a monopolist will affect the ease with which EAS plans might be implemented. If an EAS plan requires significant changes in the technical facilities, regulators could more easily mandate such changes to a monopoly supplier than to suppliers in a competitive telecommunications marketplace. Second, the redefinition of a local calling area could impact the sustainability of intraLATA toll competition. If competition exists for the long-distance calls that occur within LATA boundaries, competitors might not be able to afford to offer service if their consumer base erodes because fewer calls are toll calls. Third, the extent to which consumers use telecommunications could affect the extent to which they would be willing to pay the extra cost of EAS. Often, many customers will make mostly local calls and accept paying a premium for infrequent toll calls. However, for many business customers, and increasingly hospitals, schools and individual subscribers, distance-sensitive rates translate to higher costs to reach extended markets or needed information. These added costs are important for products with highly elastic demand.

Regulators must balance the impact of EAS on the rates of those who do not directly benefit from the service compared to the cost savings for those who use the service extensively.[42] Standard cost-benefit analyses, using economic cost data, are of limited usefulness when many of the costs and benefits are not characterized by physical entities or direct savings, but rather by social costs and benefits. These benefits may include positive externalities associated with an increased calling volume.[43] A negative impact would be that consumers who do not make long-distance calls must pay higher rates without benefiting directly.

Local calling area boundaries are subject to regulatory approval. Hence, regulators effectively determine market boundaries at the same time they determine local calling area boundaries. Therefore, regulators must be sensitive to economic development concerns and explore new approaches for cost-benefit analyses. As the role of telecommunications and information technologies increases in society, regulators' decisions increasingly function as de facto economic development policies. Ideally, these decisions would take place in conjunction with State and local economic development planning.

Coordination of Users and Providers: Leveraging Demand and Supply

Market forces often work against rural areas; this is the case for telecommunications technologies and services. The vast distances and sparse populations that characterize rural life do not generate the economies of scale and scope that make communications technologies more affordable in urban areas. Many of the subsidies that provided telecommunications to rural areas at prices less than the cost of service have disappeared since divestiture. Now rural consumers must also absorb the costs of understanding and configuring telecommunications services and technologies to fit their needs.[44] In this new environment, rural communities and businesses must find creative ways to make the same market forces that work to the advantage of corporations also work for them. However, communities will likely encounter regulatory barriers that will inhibit their efforts to exploit the market. In many cases, the same regulations designed to protect small consumers from market abuses can impede their abilities to compete.

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[39] Ibid., p. 67.

[40] Ibid., pp. 33-53.

[41] Ibid., p. 50.

[42] Often, a minority of subscribers will make the majority of the phone calls. These subscribers, however, are frequently the community leaders and volunteers, who are integral to the development process.

[43] When Colorado implemented an EAS plan, calling volume in the region increased by 500 percent. The large increase indicated that many people were now communicating because it became affordable. Moreover, increased communication tends to lead to even more communication. With such a growth in calling potential with EAS plans, regulators and local telephone companies must be prepared to make the necessary equipment upgrades to handle the new traffic.

[44] For a more detailed discussion, see ch. 3.

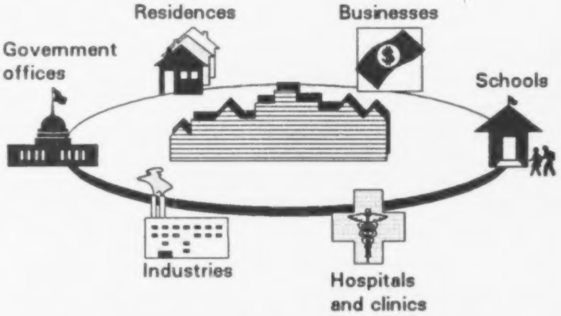
Rural Area Networks: Coordinating Users

Despite their disadvantages in the telecommunications marketplace, rural areas can take advantage of market forces to gain access to advanced telecommunications technologies and services. The notion of Rural Area Networks (RANs) illustrates a strategy that could enable rural communities to do just that. However, the current regulatory environment might discourage or inhibit such demand agglomeration. In many cases regulation may not directly prohibit shared usage arrangements, but to the extent that such arrangements are unprecedented, communities that try this type of strategy could find themselves in the midst of drawn out regulatory proceedings.

Pricing

Pricing regulation could present an obstacle to using telecommunications as part of a development strategy if RANs utilize the public switched network.[45] In most States, the local exchange carriers (LECs) must file with the PUC for each different rate, or tariff, they might offer to different customer groups—e.g., business, residential, or university—and for different services—e.g., voice, data, or video services.[46] Thus, residential subscribers pay certain rates for the use of the lines to their homes, while businesses, hospitals, and colleges may pay different rates for the lines terminating to their facilities. However, if the local community college were to share broadband capacity with local businesses, extend a link to the community's medical clinic, and connect several other community agencies or businesses with services or markets outside the community, the capacity would no longer be dedicated to the sole use of any of the individual subscribers or for any particular service (see figure 5-2).

Figure 5-2—Rural Players



A Rural Area Network can include many different players in a rural community, including small businesses, government offices, hospitals, schools, and community colleges or universities.

SOURCE: Office of Technology Assessment, 1991.

At minimum, an arrangement like the RAN described above would require that the community, the telephone company, and regulators agree on a tariffing arrangement that treated these various users as a defined group. Such agreements are commonplace, but typically involve similar entities. For example, all the State colleges in Vermont are treated as one users' group and thus all face the same rates, which are lower than would be possible if each were treated as individual users. This system benefits both the colleges, with lower rates, and the telephone company, by guaranteeing a sufficient volume of traffic over their lines. Telephone companies typically cannot define a users' group and implement a new rate without filing a tariff with the public utilities commission. Thus, even if a RAN were not controversial, it would likely require a rate hearing and substantial administrative proceeding before it was approved. Most likely, either the LEC or the community would have to hire lawyers and technology consultants in order to file for a regulatory waiver. With a RAN, this process could take a long time and a lot of energy and expense because so many different parties and types of services would be involved.

This scenario also introduces new complications into the cost-based, or de-averaged, pricing strategies that arose in the partially competitive post-divestiture telecommunications market.[47] With a shared arrangement, such as RANs, prices cannot be assigned strictly according to the cost of service for each user or each type of service since it is likely that none of the services could be provided affordably if the other services were not sharing the costs. A tariff designed specifically for RANs might require a reaveraging of costs across different user's groups, and possibly across regions.[48] Moreover, the benefits derived from access to advanced services in rural areas may not correspond to the cost of providing these services. For these reasons, standard cost-benefit analyses would be of limited usefulness in evaluating RANs unless they included the broader benefits of economic development and the opportunity costs of *not* having advanced services available in rural areas. The inclusion of such nonequipment or unquantifiable costs and benefits in regulatory and pricing calculations runs counter to the trend in telecommunications regulation of pricing according to the stand-alone cost[49] of a service.[50] It is critical, however, to consider that the economic models of telecommunications regulation that work well in urban areas may be inappropriate to apply to rural areas.

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[45] Pricing is not a concern on private networks—except for internal accounting purposes—since private networks are not subject to regulatory oversight.

[46] This is true for States with rate-of-return regulation. The extent to which the local exchange carriers must file tariffs with the PUC will vary under alternative regulatory methods.

Bypass

Just as many large businesses, universities, and State governments are opting to build their own telecommunications networks, some rural communities are finding that creating their own network would be easier than wading through lengthy regulatory procedures and convincing the telephone company that the community could generate sufficient demand for service to justify the investment in sophisticated telecommunications equipment. The town of Bloomsburg, Pennsylvania is taking such an approach. In conjunction with Bloomsburg University and the Ben Franklin Partnership, the town has proposed the construction of a high-capacity digital "highway" to Harrisburg, where it would link up with the access points of all long-distance telecommunications providers (see figure 5-3).[51] Bloomsburg decided to establish its own telecommunications system largely because alternative strategies were unavailable, or unworkable. For example, because the town cannot demonstrate sufficient demand conditions at the present, long-distance carriers are unwilling to invest in the technology that would make the link between Bloomsburg and Harrisburg unnecessary. This route also crosses a LATA

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[47] For a more detailed discussion of the movement toward cost-based pricing, see ch. 3.

[48] Prior to divestiture, prices were averaged across consumer groups. Many economists argue that price averaging introduces inefficiencies into the market, which ultimately make consumers worse off. For example, Leland Johnson argues that allocating costs in a way that allows cross-subsidization on the part of the telephone company between profitable and costly services raises the possibility of two types of dangers. First, cross subsidization could enable the regulated firm to keep other, possibly more efficient suppliers, out of the market by pricing their competitive service below the actual cost of providing it and making up the difference in the monopoly market. On the other hand, if the regulated firm is subject to price floors, under which it cannot price its services, Johnson warns of the danger of " 'umbrella' pricing, under which new entrants could undercut Bell's prices even though their costs would be higher than Bell's costs of offering the service in combination with its noncompetitive services." Leland Johnson, *Competition and Cross-Subsidization in the Telephone Industry* (Santa Monica, CA: Rand Corp., 1982), p. 19.

Concerns about cross-subsidizations can be important in markets that are truly competitive, or even partially competitive. However, the economics of providing telecommunications to sparsely populated rural areas is unlikely to support competitive provision of service, at least until ONA is a reality. John Panzar argues persuasively for the telecommunications monopoly in rural areas. See Panzar, op. cit., footnote 21, pp. 43-50.

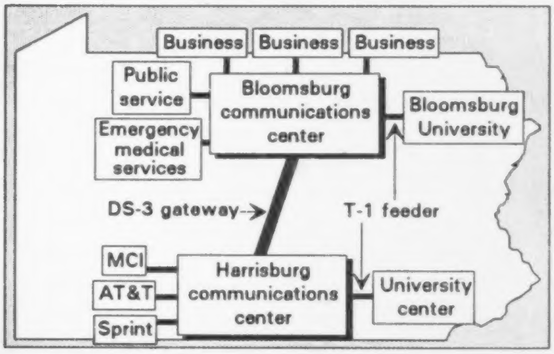
[49] Economists calculate the stand-alone cost of a service to test whether a service is *cross-subsidized by* or is *cross-subsidizing* another service. The test aims to capture whether the "revenue of the service exceeds the cost of that service produced in isolation, rather than in combination with others." Johnson, op. cit., footnote 48, p. 19.

[50] Incorporating economic development concerns into the regulatory purview is particularly difficult because the telecommunications industry is in a state of flux, with the final balance of competition and regulation unknowable. Inappropriate cost-allocation rules will yield inefficient price signals, unfairly burdening particular customers. Costing procedures become even more arcane when regulators must determine whether to allot costs within a single time period or across a longer time horizon. This problem is especially difficult for evaluating new products. In particular, with new product pricing, two factors suggest instances in which typical regulatory practices might be quite inappropriate. G.R. Faulhaber and J. Boyd, "Optimal New-Product Pricing in Regulated Industries," *Journal of Regulatory Economics*, vol. 1, 1989, pp. 341-358. First, there are customer "demonstration effects" and network externalities. People become familiar with the capabilities of new technologies by observing how their cohorts benefit from a new service. In addition, some new services are valued on the basis of number in the network: having a fax machine is much more useful if many others have compatible equipment. Thus, over time, demand-side effects cause future demand to be a function of current consumption levels. Second, there are producer "learning curve" effects. Longer production runs in early periods promote learning, which tends to lower costs in later periods.

Such intertemporal interdependencies imply that a simplistic cost-allocation scheme could doom a new service. If regulators ignore these caveats, they could reduce the rate of new product development and introduction. Period-by-period cost recovery can be very detrimental to both telcos and consumers. However, the regulator's job becomes difficult because different consumer classes will likely value quality improvements associated with network modernization differently. Moreover, these values will likely change over time, as residential subscribers become familiar with new services.

[51] The town plans to use digital microwave technology to provide the 45 Mbps of capacity between Bloomsburg and Harrisburg. In addition to voice traffic, this network could handle high-speed data, high-resolution graphics, and compressed motion video. Town of Bloomsburg, "Telecommunications Concept for the Town of Bloomsburg," 1990, pp. 4-5.

Figure 5-3—Bloomsburg, PA Telecommunications Network Configuration



The Bloomsburg Telecommunications Network aggregates the telecommunications demand of many local users, including businesses and Bloomsburg University. This aggregated traffic then travels along DS-3 lines to Harrisburg, where MCI, Sprint, and AT&T each have points of presence.

SOURCE: Dovetail Systems Corp., "Telecommunications Opportunities for Bloomsburg," Bethlehem, PA, June 1989.

boundary, so Bell of Pennsylvania cannot carry the traffic. Finally, although the public switched network could technically accommodate many of the services the town needs, town officials have suggested it is more economical for the town to build its own system because of the way the regulated services are priced.

The University of Maine faced a similar situation when it was considering expanding its fiber optic distance education network into the neighboring New England States.[52] Although the University worked out an arrangement with New England Telephone to deploy the fiber optic network within Maine, the LEC could not offer its services across the State's border because interstate traffic is the domain of the interexchange carriers (IXCs), such as AT&T, MCI, and Sprint, and is regulated by the FCC. The interstate tariffed rates for DS-3 lines were so prohibitively expensive[53] that it made more sense for the university to build digital microwave links across the State borders to link up with the networks in the other States.[54]

The logistical problems that the University of Maine and the town of Bloomsburg face in developing their RANs will likely confront many rural communities and community organizations as they begin to explore using telecommunications as part of an economic development strategy. Because the regulatory system could not accommodate economic development concerns, Bloomsburg and the University have few options but to bypass the public network. Although building a RAN—or part of a RAN—on privately owned facilities might be the least expensive solution for the immediate future, the cost of many small networks will almost surely exceed the cost of extending advanced technology along the public switched network to these communities. Thus, there is a significant cost of failing to reconcile economic development and regulatory policies.

Rural Area Networks: Coordinating Providers

Consortia of telecommunications providers can take advantage of market forces in much the same way that coalitions of users can leverage market power to gain access to advanced telecommunications services and technologies. By cooperating or entering joint ventures, telecommunications providers can distribute the high costs and diminish some of the risk of investing in advanced telecommunications technology in rural areas. However, regulatory restrictions and anti-trust considerations often prevent or impede such arrangements from developing. In many cases, the regulations and laws that inhibit the formation of a telecommunications consortia were developed to protect consumers from market abuses that typically occur when suppliers collude with one another.

Iowa Network Services (INS) illustrates the problems that could arise if telecommunications providers ally to create RANs. INS is a consortium of 128 of Iowa's 150 independent telephone companies that joined forces in 1984 to build a fiber optic network providing centralized equal access to rural communities across the State.[55] Individually, none of the independent companies could have afforded to

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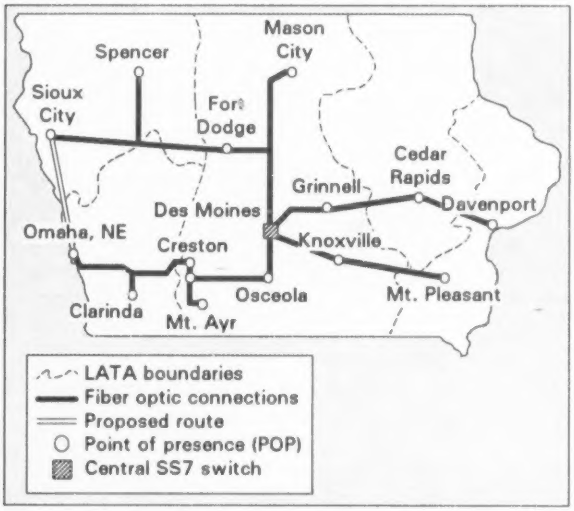
[52] The expansion has not yet occurred.

[53] The interstate rate is so expensive because of the capacity required to transmit a video message, like those used for distance education or teleconferencing. Essentially, sending one video message is equivalent to sending thousands of data streams.

[54] Estimates for the tariffed DS-3 lines were around $1.2 million, compared to the $300,000 to $400,000 estimated cost of the microwave links.

[55] William H. Davidson, Anne C. Dibble, and Sandra C. Hom, *Telecommunications and Rural Economic Development* (Redondo Beach, CA: MESA Inc., 1990).

Figure 5-4—Iowa Network Services



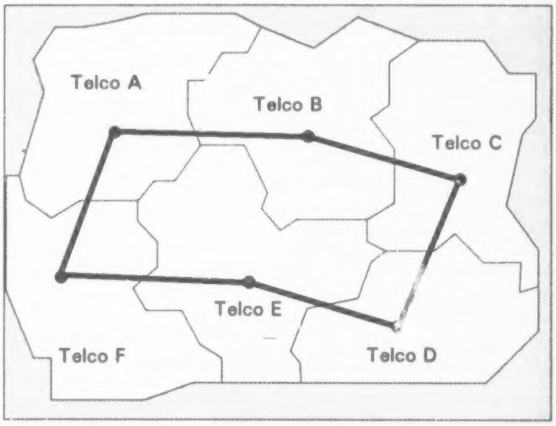
Iowa Network Services is a consortium of independent telephone companies, who jointly invested in a fiber optic network and an SS7 switch.

SOURCE: *The INS Story* (Des Moines, IA: Iowa Network Services, 1990).

provide such sophisticated services to their rural customers. Organizing the consortium and finding financing for their venture proved to be only the first hurdle these independent companies encountered in offering advanced telecommunications capabilities to their customers. The BOC serving Iowa brought an anti-trust suit against INS in an effort to block the network. The suit failed, but it took 3$^1/_2$ years of Federal and State regulatory hearings and proceedings before INS could offer its services (see figure 5-4).[56]

In contrast to the INS experience, a group of independent telephone companies in South Carolina encountered few regulatory or legal obstacles when they joined together to form a fiber optic network, called PalmettoNet. Each participating, independent telephone company built, operates and maintains the section of the network that passes through their territory. The consortia, PalmettoNet, then leases capacity from the individual companies to create the unified network (see figure 5-5).[57]

Figure 5-5—Palmetto Network Configuration



PalmettoNet is a consortium of independent telephone companies in South Carolina, who jointly invested in a fiber optic network.

SOURCE: Harmeet Sawhney, University of Texas at Austin, 1991.

Arrangements such as Iowa Network Services and PalmettoNet take advantage of synergies to make market forces work to the advantage of rural subscribers. These approaches require strategic planning at the regional level, rather than at the level of each independent telephone company.[58] Thus far, such consortia are largely unprecedented. Therefore, their legality or feasibility remains untested in many markets. As the examples show, it is difficult to predict the extent to which companies will face regulatory or legal obstacles. Where uncertainties exist, stakeholders who are opposed to the strategy might use the regulatory and legal system to halt progress on such a project. Therefore, anti-trust suits will be likely if the dominant carrier in a region perceives such networks as a competitive threat.

Currently, regulatory and development policy in most States and at the Federal level is unprepared to deal with creative approaches, such as user coalitions and provider consortia, to technology deployment in rural areas. If rural areas are to access advanced communications technologies in an economical fashion, it is critical that policymakers at the local, State, and Federal levels think about and plan for such arrangements.

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[56] Ibid.

[57] Harmeet Sawhney, "Complementarity Strategy," contractor document prepared for the Office of Technology Assessment, November 1990.

[58] Harmeet Sawhney, "Rural Telecommunications: A Cultural Hypothesis" (draft), doctoral dissertation, The University of Texas at Austin, 1991.

Chapter 6

The Role of the Federal Government: Orchestrating Cooperation and Change

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Chapter 6

The Role of the Federal Government: Orchestrating Cooperation and Change

Findings

The Federal Government can play an important role in rural economic development. To do so, it must exercise leadership and make rural development and the use of communications technologies in the development process a national priority. The diversity of rural conditions across the Nation means that the development goals set by the Federal Government must be broad, allowing for more specific goals and strategies to be formulated and executed at the State and local levels. In addition to vision, the Federal Government must provide a commitment of financial and technical support.

Many players at the Federal, State, and local levels must be involved in a holistic rural development strategy. Competition for turf and economic rewards hinders the cooperation among players necessary for economic development and the efficient use of communication technologies in rural areas. Many stakeholders have never had to deal with one another before, and there are no incentives to do so now. Given the important role of communication in society and the growing market value of communications systems, the stakes involved in providing communication services are higher than ever before. As a result, stakeholders vie to take the lead in configuring and controlling the communication infrastructure since often only one network is economically feasible given economies of scale and scope. With divestiture and the unbundling of the communication infrastructure, there are also many new players competing for a piece of this highly lucrative communication market.

As part of its role, the Federal Government must help to orchestrate the kinds of changes and cooperation among Federal and local agencies needed for economic development to take place. Working through existing organizations, such as the U.S. Department of Agriculture's Rural Electrification Administration, Rural Development Administration, and the Cooperative Extension Service, it must increase the incentives for cooperation at the local level, and make it more costly for those who fail to work together.

U.S. POST OFFICE

Photo credit: Russell Lee

The post office in Costilla, NM in 1939.

Introduction

The Federal Government has consistently taken steps to promote rural America's well-being throughout American history. In the earliest years, government policies were designed to encourage farming and successful settlement. To link the rapidly expanding Nation, the Federal Government developed a rural infrastructure, fostered a public education and library system, and promoted the dissemination of public information and news. To meet the needs of the industrial revolution, it promoted rural electrification and the transfer of industrial technology to rural applications.

The Federal Government set up a variety of organizations to implement its rural policies. Among these, for example, were the Postal Service, the Department of Agriculture and Cooperative Extension Service, the system of public schools and land-grant colleges, and the Rural Electrification Administration.

As rural communities continue to struggle for their survival, the question is raised as to what role the Federal Government should play in assisting them today. To provide an answer, it is necessary to consider the traditional goals of Federal rural policy; how well it has been executed; what organizational resources are available to the Federal Government and the demands likely to be placed on them; who are the key organizational players and decision-makers; what are their stakes; and how might they best work together.

From Farm Policy to Rural Policy

Federal policy, in the earliest years of the Republic, was designed to establish a Nation of small farmers. It set the tone of rural policy for many years to come.[1] Concern about farmers and farming became the justification for Federal support of rural areas. Rural well-being was equated with successful farming, just as rural policy was viewed as an aspect of farm policy. This perception became so entrenched that rural policy has failed to keep pace with major demographic changes.[2] Although farmers now constitute somewhat less than 2 percent of the Nation's population, farming continues to be the major beneficiary of Federal rural policy (see box 6-A). These policies and perceptions are likely be superseded again as the Nation moves forward into the information age.[3]

Thomas Jefferson, the leader of the Republican Party and later President, was the individual most responsible for pursuing profarm policies.[4] Jefferson not only loved farming; he also believed that an agrarian environment fosters honesty, self-sufficiency, and egalitarianism.[5] As President, Jefferson opened the land for settlement by small farmers. To secure these areas, Jefferson dislodged foreign governments and Native Americans. He also opposed land speculation to allow settlers to establish themselves on the frontier. Subsequent administrations continued to support farmers for the most part.[6]

Box 6-A—Farm Spending and Rural Spending

In fiscal year 1987, $29 billion was spent on development programs for all of rural America, while $22.4 billion was spent on agricultural price and income support alone. Furthermore, a large proportion of agricultural subsidies were spent supporting the least needy farmers. In 1987, the wealthiest 15 percent of farmers received over half of direct government agricultural subsidies.

SOURCE: U.S General Accounting Office, *Rural Development: Federal Programs That Focus on Rural America and Its Economic Development*, briefing report to the Ranking Minority Member, Subcommittee on Conservation, Credit, and Rural Development, Committee on Agriculture, House of Representatives, GAO/RCED-89-56BR, January 1989, p. 29.

While Federal land policy was successful in securing land for small farmers, a more proactive Federal policy was required to assure these farmers success. In 1862, the Federal Government established the Department of Agriculture and the land-grant college system,[7] which were designed to provide this kind of support. A variety of assistance programs were administered through the Department of Agriculture including the land-grant college system, agricultural research, agricultural extension, and vocational training.[8]

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[1] As described by Forest MacDonald: "They . . .set out to secure the frontiers of the United States by expanding the country's territorial domain into the base wilderness, and they succeeded so well that it became possible to dream that the United States could remain a nation of uncorrupted farmers for a thousand years to come." Forest MacDonald, *The Presidency of Thomas Jefferson* (Lawrence, KS: University of Kansas Press, 1976), p. 163.

[2] As Swanson notes, "It was the financial crisis in farming during the mid-1980s which, ironically, provided the need for a revised rural development policy. Since part of the problem was the assumption that farm well-being determines rural community well-being, the reintroduction of rural development in the context of a farm crisis has had the effect of reaffirming this assumption." Louis E. Swanson, "The Rural Development Dilemma," *Resources*, summer 1989, p. 15.

[3] Louis Swanson, "Dilemmas Confronting Rural Policies in the U.S." Paper presented to the National Rural Studies Committee Meeting held in Cedar Falls, Iowa, May 17-18, 1990.

[4] Jefferson's vision, in harmony with major religious values and personal interests, may have been vital in turning America toward an agrarian democracy. A much different result occurred in Argentina, which had a similar frontier of rich vacant lands settled by European immigrants. Argentina, however, was claimed by a landed aristocracy, leaving farm people unschooled, powerless, and physically isolated. In the U.S. South, too, the tobacco, rice, and cotton "slavocracy" presented a discomforting antithesis to the emergent ideal of agrarian democracy. Don Hadwiger, "A History of Rural Economic Development and Telecommunications Policy," contractor report prepared for the Office of Technology Assessment, January 1990.

[5] As noted by Griswold, "No one believed so implicitly [as Jefferson] in a causal connection between the occupation of farming and the political system of democracy, and no one, before or since his time, has given that belief a greater impetus among his countrymen." Whitney A. Griswold, *Farming and Democracy* (New Haven, CT: Yale University Press, 1952), p. 19.

[6] Hadwiger, op. cit., footnote 4. This farm bias reflects, in part, the political power of the farm community, which became organized in the late 19th century. During this period, many farmers suffered severe hardships due to drought, low commodity prices, high freight costs, and increased real costs of borrowed money. In response to such adversity, they organized farm organizations such as the Grange, Greenbacker, and Alliance.

[7] Sandra S. Osbourn, *Rural Policy in the United States: A History* (Washington, DC: Congressional Research Service, The Library of Congress, 1988), 880487 GOV, p. 15.

Federal policymakers began to distinguish rural problems from farm problems only at the turn of the century.[9] Commissioned by the Roosevelt Administration to investigate why rural areas were falling behind urban areas, the Country Life Commission found that the problems of the countryside could not be overcome simply by focusing on agriculture. Accordingly, the Commission recommended that Federal assistance "... should be designed to forward not only the business of agriculture, but sanitation, education, homemaking, and all interests of country life."[10] In releasing the Commission's report, President Roosevelt called for the establishment of a Department of Country Life "fitted to deal not only with crops, but also with the larger aspects of life in the open country."[11]

Farming remained the focus of the Federal Government's policy response despite the growing awareness of the complexity of rural problems.[12] This emphasis was nowhere better illustrated than in the case of the Agricultural Adjustments Act, which was passed as part of the New Deal. This Act made the Federal Government essentially responsible for the economic and social well-being of rural America.[13] It sought to stabilize farm prices by controlling commodity surpluses, to forestall mortgage foreclosures and improve access to credit, and to improve farmers' prices and incomes in relation to other businesses.[14] Even though the Act was viewed as a temporary response to the farm crisis, most of the programs it established still exist.

A strong interest in rural problems unrelated to farming did not reemerge until the Administration of President Eisenhower. In a special message to Congress, Eisenhower called for a program to help low-income farmers. But unlike previous programs that focused exclusively on farm income support, Eisenhower's program looked to off-farm employment as part of the solution, and acknowledged the need to address problems of health and education. Because it conceived of the "rural" problem broadly to include health, education, and other human services, the Eisenhower Administration also needed a mechanism for interagency coordination. To this end, the President established an interdepartmental committee—the Committee for Rural Development Program—chaired by the Under Secretary of Agriculture and comprised of the Under Secretaries of the Interior; Commerce; Labor; and Health, Education, and Welfare; the Administrator of the Small Business Administration; and a member of the Council of Economic Advisers.[15]

Subsequent Presidents, until the time of President Reagan, followed in these footsteps. Under President Kennedy's Administration, programs were extended to take into account the entire rural economy and community.[16] President Johnson, who described rural poverty as "America's unfinished business," fostered rural economic development as part of his Great Society program.[17] He claimed that during his administration 184 measures providing assistance to farmers and rural communities were signed. President Nixon, too, supported a rural policy, although he wanted to shift much of the burden for its implementation to the States.[18] President Carter went the furthest in developing a comprehensive plan to address rural needs. His Administration sought to institutionalize rural development policy at the national level with the passage of the Rural Development Policy Act (Public Law 96-355).[19] There was little chance for policy implementation, however, since shortly after the Act's passage President Carter lost the Presidency to Ronald Reagan, who strongly opposed an activist rural policy. He believed such matters are better left to the States and private sector.[20]

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[8] Ibid.

[9] A major impetus for rural improvement came from the Progressive movement under the leadership of President Theodore Roosevelt, Woodrow Wilson, and Robert LaFollette.

[10] As quoted in Wayne D. Rasmussen, *Taking the University to the People: Seventy-Five Years of Cooperative Extension* (Ames, IA: Iowa State University Press, 1989), p. 44.

[11] U.S. Presidents, 1901-1909 (Roosevelt). *Report of the Country Life Commission: Special Message From the President of the United States Transmitting the Report of the Country Life Commission*, Senate Document No. 705, 60th Cong., 2d sess. (Washington, DC: U.S. Government Printing Office, 1909), p. 6.

[12] This emphasis was perpetuated, in part, because farmers maintained their political power even while their standard of living continued to deteriorate.

[13] Osbourn, op. cit., footnote 7, p. 24.

[14] After World War I, farm prices dropped precipitously, setting off a trend that continued for more than a decade. To provide relief, Congress twice passed the McNary-Haugen Farm Relief Bill, but President Coolidge vetoed it. Under President Hoover, the Agricultural Marketing Act of 1929 was passed. It created a Federal Farm Board that tried to stabilize prices by buying and selling farm commodities. Osbourn, op. cit., footnote 7.

[15] Osbourn, op. cit., footnote 7, pp. 30-32.

[16] Responding to this shift in goals, Secretary of Agriculture Orville Freemen made the rural development program the centerpiece of his department. He created an Office of Rural Development, a Rural Areas Development Board of department officials, and a public advisory committee. In addition, the interagency committee for Rural Development Program was replaced by a Rural Development Committee, whose membership was upgraded from the level of undersecretary to Secretary. The Secretary of Agriculture was named chair. Osbourn, op. cit., footnote 7, pp. 33-34.

[17] Lyndon Johnson's rural policy was quite comprehensive. "A national policy for rural America with parity of opportunity" was its stated goal. The key elements were: national economic prosperity to increase employment opportunities; full access to education, training, and health-care services to expand earning power; and economic development of smaller and medium-sized communities to insure a healthy economic base for rural America. See Osbourn, op. cit., footnote 7, pp. 37-40.

The Bush Administration is implementing mechanisms to better coordinate and focus the Federal rural development effort.[21] While the direction of these efforts is promising, the coordinating and leadership mechanisms are still in a formative stage. And the Administration does not yet have, and is not close to preparing, a government-wide rural development strategy; at most, it has laid down some general principles.[22]

The time is ripe for refocusing rural policy. Rural communities are, today, once again undergoing major structural changes—the transformation to an information society, the shift to a global economy, the problem of environmental constraints. In light of these trends, it is particularly important to consider what role communication and information technologies can play in fostering rural economic development.

Insufficient attention is being paid to this issue at present. Although the Federal rural economic development legislation enacted by the 101st Congress acknowledges the importance of telecommunications and provides a specific role for communications in the development process, the bill takes a cautious approach.[23] It does not provide a clear vision of the role of technology as a central force in the development process.

Establishing a formal goal of promoting rural economic development through telecommunications will signal a commitment and serve as a criterion against which policy choices can be weighed and policy actions evaluated. Moreover, a goal statement would provide a basis for allocating and coordinating institutional responsibilities and for determining the efficiency and effectiveness of specific programs. Setting goals is particularly important today, given problems of balancing the budget. With the pie shrinking, current program beneficiaries, trying to secure their "fair share," will most likely lobby intensely against efforts to rethink or redirect program priorities. Opposition such as this will be less successful, however, if there is a clear vision of the role that telecommunication plays in promoting economic development.

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[18] As described by Osbourn, op. cit. footnote 7, p. 46. See also, U.S. President, 1969-1974 (Nixon), Special message to Congress on sharing Federal revenues with the States. Public papers of the Presidents: Richard M. Nixon, 1969 (Washington DC: U.S. Government Printing Office, 1971), p. 668.

[19] This Act sought to achieve four basic goals: meet rural citizens' basic needs; provide employment and business opportunities; address rural problems resulting from distance; and promote the stewardship of the Nation's resources and environment. Osbourn, op. cit., footnote 7, pp. 53-58.

[20] Osbourn, op. cit., footnote 7, p. 67.

[21] See later discussion of "Federal Policy Execution," pp. 148-149; U.S. Department of Agriculture, *A Hard Look at USDA's Rural Development Programs*, report of the Rural Revitalization Task Force to the Secretary of Agriculture, June 30, 1989; Economic Policy Council, Working Group on Rural Development, *Rural Economic Development for the 90s: A Presidential Initiative*, January 1990; and U.S. Department of Agriculture, Office of the Under Secretary for Small Community and Rural Development, *Signs of Progress: A Report on Rural America's Revitalization Efforts* (Washington, DC: USDA, January 1989).

[22] A national advisory commission to USDA recently issued a report outlining some general principles. For example, the commission concluded that: as rural America is diverse, so are its problems;

- neither farm policy nor any other single-issue policy can sufficiently address the needs of rural America;
- there is currently no defined rural development policy;
- rural development is important for the economic efficiency and security of this country.

The commission recommended that the Federal Government:

- review all its policies to determine their effects on rural areas;
- improve information about rural conditions and development strategies;
- adopt a comprehensive approach to rural development . . . that process must assure a holistic approach to rural development policy within the Federal government. . .
- adopt a strategic approach to rural development;
- foster better cooperation among rural development participants;
- incorporate flexibility in its policies relating to rural areas;
- promote innovation and experimentation in the pursuit of rural development;
- make education a major component of rural development policies.

For further details, see National Commission on Agriculture and Rural Development Policy, *Future Directions in Rural Development Policy* (Washington, DC: USDA, December 1990).

[23] The Rural Economic Development Act of 1990 seeks to assure that modern communication technologies are available in rural areas by making it easier for rural telephone providers to borrow money from the Rural Electrification Administration (REA) and the Rural Telephone Bank to modernize their networks. The Act further envisions the use of communication technology to achieve other economic development goals, such as improving educational and medical resources.

Establishing formal goals is, however, one of the hardest policies to implement. Policymakers avoid setting goals precisely because they focus on the question of how scarce resources should be distributed among groups and organizations.[24] By not questioning goals, or by speaking of them only in the broadest sense, decisionmakers can be held less accountable to those stakeholders who are losers in the goal-setting process. It might be especially difficult to set this kind of goal because there continues to be a lack of awareness of, and skepticism about, the role that new communication technologies can play in the development process.

Past Federal Roles

The Federal Government has played two major roles in implementing its rural policy—one as the provider of infrastructure, the other as the provider of information and education. It is useful to consider the Federal Government's performance in these roles, since both are still relevant today.

Infrastructure Building

Today's communication networks are often compared to earlier transportation networks.[25] And many people call on the Federal Government to play a greater role in their development, similar to the one played in developing canals, railroads, and highways. It is wise to draw on this previous experience in considering the role the Federal Government might play in developing a rural communication infrastructure. Support for Federal infrastructure projects was never universal. Thus, the government generally assumed a major role only when it became clear that the private sector would not do so.

The same values that led Jefferson and Jackson to support small farmers made them oppose a Federal role in infrastructure building. From their perspective, "the best Government is that which governs least."[26] In time, however, the farmers who had benefited from Jefferson's policies became politicized, and they voted to commit their governments to regional and local transportation projects. State and local governments thus became the crucial actors in building the Nation's infrastructure.[27] They enacted friendly civil laws; arranged for public grants, loans, and stock purchases; and granted land for yard facilities and rights-of-way. Many citizens also invested their savings in what has been described as a "speculative orgy of highway, canal, and railway building."[28]

The Federal Government also became a reluctant sponsor of rail development, under pressure from the States. During early rail development, the Federal Government offered a tax subsidy in the form of tariff reductions on materials. After 1850, it made large land grants to the States for the purpose of financing railroad construction. And in the 1860s, the Federal Government began to distribute land grants for transcontinental roads as well.

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[24] Herbert Simon, "On the Concept of Organizational Goals," *Administrative Science Quarterly*, vol. 9, No. 1, June 1964, p. 3.

[25] See for example, Peter Westermeyer, *Electronic Highways: An Introduction to Telecommunications in the 1990s* (London: Allen & Unwill, 1990).

[26] For example, the Jeffersonians and Jacksonians rejected plans put forward by Secretary of the Treasury, Alexander Hamilton, to build a national banking system and other infrastructure—believing that it would favor the gentry class. Later they opposed national development plans put forward by Whig party leader Henry Clay, Speaker of the House. Clay wanted to construct national roads and canals and, ultimately, national railroads as well. Jefferson and Jackson, in denying these initiatives, encouraged State and local governments to undertake this development. President Jackson, by decentralizing the financial system, provided investment capital for the hinterlands. Hadwiger, op. cit., footnote 4, p.7.

[27] Jefferson did approve an act to establish a "Cumberland highway" from Cumberland, Maryland across the mountains to Ohio. Subsequent Congresses provided funding obtainable as 5 percent of the proceeds from public land sales. When President Monroe vetoed road appropriations, the management of the Cumberland road was transferred to the States through which it passed. The Cumberland, however, fell into disrepair as did several other "highways" when canals and then railroads provided superior transport. Roads were then used mainly for local traffic and were maintained by local governments. U.S. Congress, *Report of the Joint Committee on Federal Aid in the Construction of Post Roads* (63d Cong., 3d sess., 1941), pp. 240-241.

[28] The State of New York financed construction of the Erie Canal to link the Hudson River with the Great Lakes, which quickly became a principal route for Western migration, drawing Western settlement into a Northern pattern. The Erie drastically reduced freight rates to and from the hinterlands and made the Port of New York the Nation's major commercial center. Hadwiger, op. cit., footnote 4, p. 8. Given the Erie's success, New York as well as several other States, including Pennsylvania, Maryland, and Ohio, joined with private corporations to finance vigorous development of canals and other internal improvements. This speculative effort collapsed with the panic of 1837. Most of the roads and canals were soon superseded by railroads, the new communication technology.

The telegraph was another communications system inaugurated with Federal assistance. In 1834, Congress authorized funds for Samuel F.B. Morse to build a demonstration line between Washington, DC and Baltimore. But Congress refused to nationalize the telegraph, as Morse requested, preferring that the private sector finance and deploy it.

The Federal Government also played a critical role in assuring the deployment of electricity and telephones to rural areas. Most urban citizens had access to electric service by the turn of the century, but America's farmers were not served until much later. Even by 1935, fewer than 12 percent of America's farms had electricity.[29] Private utilities were unwilling to provide service to rural areas because demand seemed low and the technical problems high. At first, the Federal Government sought to assist and encourage private industry rather than displace it. But President Roosevelt was unimpressed by industry's response, so he created the Rural Electrification Administration.[30] REA bypassed the municipal and private utilities. Instead of cooperating with them, it built its own network with "grass roots" support. REA's goals were ambitious: universal, high-quality service, rapid deployment, and low rates. It was quite successful in achieving them. Few rural cooperatives defaulted, since usage rose so quickly. By 1940, 30 percent of all farmers had electricity. By 1950, 77 percent were served, and by 1959, 96 percent. Rural cooperatives also played an important role in economic development, facilitating the movement of industrial, commercial, and nonfarm residents to rural areas.[31]

Despite (or perhaps even because of) these successes, REA had its detractors. After 1950, the private utilities' lobby sought to shut it down. They claimed that REA was no longer needed because its job was virtually complete. To gain support for their position, they portrayed REA as "socialistic" and unfairly competitive. But REA had its own political support. The National Rural Electric Cooperatives Association (NRECA) provided a powerful grassroots voice. Moreover, REA was well situated in the protective environment of the Department of Agriculture. It was also a "favorite" of many rural Congressmen.

Photo credit: Russell Lee

An old-fashioned telephone used for communication in a gold mine in Mogollon, NM, 1940.

Looking for a new mission, REA welcomed the task of deploying telephones to rural areas, which were still largely unserved by telephones in the late 1940s.[32] Legislation permitting REA to play such a role was first introduced into Congress in 1945, where there was substantial support. However, strong opposition from the independent telephone companies and private utilities prevented its passage. A compromise bill was passed in 1949 with President Truman's passive support. In accordance with the compromise, REA was permitted to form rural telephone cooperatives such as had been used in rural electrification, but the ''independent'' telephone companies were given the right of first opportunity. As it turned out, most REA loans went to the independents. Some telephone cooperatives were also undercut by Bell companies, which moved quickly to offer modern services in contested areas.[33]

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[29] During the first quarter century, farmers had not pressed for electricity. Their main interest was in raising commodity prices. Nor apparently was the research-extension system troubled by the delay in modernization caused by lack of rural electricity.

[30] John D. Garwood and W.C. Tuthill, *The Rural Electrification Administration: An Evaluation* (Washington, DC: The American Enterprise Institute, 1963), pp. 4-5.

[31] Rural electric cooperatives aggressively recruited and served industrial, commercial, and suburban consumers, which had the effect of increasing the number of consumers each year, from 5 million in 1960 to 12 million in 1987. U.S. Department of Agriculture, Rural Electrification Administration, *A Brief History of Rural Electric and Telephone Programs* (Washington, DC: USDA, REA, 1989).

[32] Interestingly, 39 percent of all farmers had obtained rudimentary service by 1920 (organized by neighborhood cooperatives), but due to hard times, this service was allowed to deteriorate, and by 1940 only 25 percent of farm residences had working telephones. U.S. Census, compiled by U.S. Congress, House Committee on Agriculture, 1949, p. 2.

REA was able to achieve high-quality, state-of-the-art service, working mainly with the ''independents.'' To serve widely scattered rural residences, REA pioneered technology to reduce size of wire, its cost of installation, and its vulnerability to lightning and icing. REA borrowers replaced party lines with one-party service. Rates were standardized and comprehensive ''area'' coverage was provided. By 1980, 94 percent of all farms were served by telephones.[34]

The Federal Government's support of highway building began as early as 1932, when Congress enacted a penny-per-gallon gas tax.[35] The rationale and the means of financing the Nation's highway system were distinct from other infrastructure projects. Presidents Hoover and Roosevelt both believed that massive spending for road construction would provide jobs during the depression.[36] President Eisenhower justified Federal support for highway construction on national defense grounds.[37] To finance this road-building program, Eisenhower set up a Highway Trust Fund to be replenished from increased highway user taxes.[38]

Highway construction had a profound—even if often unanticipated—effect on rural America. Road building brought rural and urban areas closer together, forcing many small communities to deal with urban values for the first time. Highways also facilitated massive rural outmigration. They were also a precondition for agricultural specialization, which in turn reduced agriculture's labor needs, inducing many farm people to seek urban jobs. At the same time, highways contributed to population decentralization. Nonfarm employment expanded in the hinterlands along freeways and other modern roads. Industrial belts grew up in the towns and countryside along highways, especially in the Southern and border States. The Nation's midsized cities, linked by freeways, also grew. In addition, express highways allowed people to exercise a preference for residence in smaller communities.[39]

Looking backward, it is clear that the Federal Government was an indispensable backer of the Nation's infrastructure, providing venture capital and other incentives when private capital was unavailable, and even doing the job itself, when required. Public policy undoubtedly enabled the timely and widespread development of each new communication system, and these systems facilitated the rapid settlement and integration of America's rural heartland.

This retrospective account not only describes the historical basis for government involvement in infrastructure building, it also suggests some models for action that the Federal Government might adopt today. REA is a particularly useful model, given its past success in encouraging technology deployment in rural areas. Recent analyses suggest that advanced technologies will not be quickly deployed to rural areas without some form of government intervention. REA could assume the role of helping to finance and facilitate the development of Rural Area Networks, just as it took on the additional task of providing telephone service. Most important, REA could help rural communities and development agencies serving rural areas sort out their communication needs and explore new ways of meeting them.

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[33] Dan F. Hadwiger and Clay Cochran, ''Rural Telephones in the United States,'' *Agricultural History*, vol. 58, 1984, p. 232.

[34] USDA, REA, op. cit., footnote 31, p. 7.

[35] Road planning began after 1905, when automobiles became numerous. By 1915, 39 States had created highway departments. Road building gained an impetus in State legislatures, where farm organizations and rural groups often controlled decisions. During the 1920s, the States constructed 1.3 million total miles of improved roads. Mark H. Rose, *Interstate Express Highway Politics, 1941-1956* (Lawrence, KS: The Regents Press of Kansas, 1979), pp. 4-7.

[36] Hoover's recovery agency, the Reconstruction Finance Corporation, lent $300 million to the States for road construction. Between 1934 and 1937, the Roosevelt Administration spent $28 billion for road construction. The U.S. Bureau of Public Roads, located within the U.S. Department of Agriculture until 1939, envisioned a 30,000-mile ''expressway system'' to speed traffic, eliminate urban and rural decline, and create jobs. But President Roosevelt came to view highway building as a poor way of creating jobs, and he feared that the development of a ''superhighway system'' would unbalance the Federal budget. He began to cut back on road-building as the Nation prepared for World War II. Hadwiger, op. cit., footnote 4, p. 28.

[37] During President Truman's Administration, road-building failed to keep pace with increased road use. There was no consensus about the Federal role. Rural Senators Milton Young (ND) and John Stennis (MS) sponsored increases in road appropriations including $100 million for farm highways. However, at the same time, the U.S. Chamber of Commerce opposed farm highways, characterizing them as ''national socialism.'' President Truman cut back on road construction during the Korean War, even as road use was sharply increasing. Rose, op. cit., footnote 35, p. 40.

[38] This Fund was established by the Highway Act of 1956. Its passage inaugurated a period of accelerated highway improvement.

[39] Hadwiger, op. cit., footnote 4, p. 29.

With its successful lending experience and technical expertise, REA could play a key role in launching experimental approaches to deploying technology. REA could establish forums and discussion groups of community leaders, communication providers, and communication users to consider rural communication needs, and explore how communication systems might be designed to meet these needs. In a more proactive mode, REA might conduct research and development to investigate new and creative ways of deploying advanced communication and information technologies to rural areas and/or provide financial support for demonstrations and trials of such strategies. REA could serve as an honest broker between borrowers and potential users. It could also provide loans and technical assistance to groups of users and providers who undertake cooperative ventures.

To play this kind of an expanded role, REA will need much greater resources. The REA telephone program staff has dropped from a high of 500 to 149 employees. And the remaining staff has little familiarity with rural development in general. So additional staff and staff training are essential. REA will also need greater political support if it is to be successful. REA's very existence has often been in dispute. Most recently, the Reagan Administration claimed that REA has outlived its mandate, since universal service has been achieved and rural telephone companies are financially sound. For REA to get a new mandate, therefore, may require Congress to redefine the notion of universal service in the context of an information age.

The Rural Economic Development Act of 1990 includes measures to expand REA's role in several respects. It creates a new REA Assistant Administrator for Economic Development to carry out REA programs that involve rural electric and telephone systems in community and economic development. It provides the REA Administrator with additional powers and assigns duties to provide advice and guidance, establish and administer pilot projects and demonstrations, and act as an information clearinghouse for dual development-related activities of REA borrowers. REA's technical assistance role is strengthened across the board. Finally, the Act reaffirms the continuing importance of the REA loan program, and calls on it to play an even greater role.

Promoting Information Dissemination, Science, and Education

The Federal Government's role in promoting information dissemination, science and technology, and education has its origins in the Constitution: the First Amendment guarantees freedom of speech and press; Article I, section 8 authorizes the Federal Government to grant intellectual property rights; and Article I, section 8, paragraph 7, permits the Government to build postal roads.[40] The Federal Government took advantage of the postal provisions to subsidize the distribution of news in the late 1700s.[41] After the Civil War, the Federal Government played a major role in the development of libraries[42] and the American public school system.[43] Towards the turn of the century, it became more activist in promoting science and technology especially through the university system.[44] These policies reflected the notion, so prevalent in the United States, that education and knowledge have distinct public benefits and play an essential societal role.[45]

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[40] The American attitude towards information dissemination differed radically from that in Europe, where the ruling monarchs regarded it with considerable alarm. However, building a Nation required the establishment of communication links, the development of a unified market, the forging of a common culture, and the building of a democratic policy. The widespread flow of information was essential to accomplish these tasks.

[41] See Richard B. Kielbowitz, "Newsgathering by Printers' Exchanges Before the Telegraph," *Journalism History*, vol. 9, summer 1982, pp. 42-48; and Samuel Kernell, "The Early Nationalization of Political News in America," *Studies in American Political Development* (New Haven, CT: Yale University Press, 1986), pp. 255-278.

[42] In the United States, libraries have always been regarded as popular educational institutions. Like the public schools, they derived their support from the public education and reform movements that developed after the Civil War. Traveling libraries were founded to bring news and reading materials to rural areas where book deposit stations were set up in grange halls, neighborhood stores, fire stations, and women's clubs. In cities, libraries were established not only to provide access to books but also—like the settlement houses—to provide a haven and adult education programs for a growing number of working-class immigrants. These libraries developed rapidly during the post-Civil War period, and even continued to thrive in the depression years. See V. H. Mathews, *Libraries for Today and Tomorrow* (Garden City, NY: 1976).

These overriding values helped structure the Federal Government's response to the farm crisis that followed the Civil War.[46] The Federal Government sought to help farmers adjust to the structural changes in the economy by developing and transferring modern technology to agriculture.[47] Working through the Department of Agriculture, the Federal Government eventually established four different types of complementary programs:

- land-grant colleges;[48]
- supporting research on agricultural problems at agricultural experiment stations;[49]
- making basic information on farm and home problems available to people through the extension service;[50] and
- providing vocational training on agricultural problems, home economics and industrial subjects.[51]

The Country Life Commission, established under President Theodore Roosevelt, also advocated Federal assistance in bringing "both information and inspiration" to all farmers. There had already been a number of experiments for providing education and information to rural communities, and the Commission recommended that these activities be "nationalized."[52] Among these were Deaman Knapp's

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[43] The American commitment to public schooling grew in the wake of the Civil War. This commitment was so intense that it gave rise to a national crusade to establish public schools. Concerned about the problems of reconstruction in the South, the influx of Catholic immigrants, and the advent of industrialization in the North, Americans saw public schooling as a way of preserving the social, economic, and political order. See Rush Welter, *Popular Education and Democratic Thought in America* (New York, NY: Columbia University Press, 1962); and David Tyack and Elisabeth Hanson, "Conflict and Consensus in American Public Education," *America's Schools: Public and Private, Daedalus*, summer 1981.

[44] If should be noted that just as democracy was closely associated with farming, so too was it linked with technology. A democratic polity was thought to be a prerequisite for advancement in applied science, while technological achievements were expected to provide the physical means of achieving the democratic objectives of political, social, and economic equality. See Hugo A. Maier, "Technology and Democracy, 1800-1869," *Journal of American History*, vol. 43, p. 625. For a discussion of the evolution of the university system, see Edward Shils, "The Order of Learning in the United States From 1865-1920: The Ascendancy of the Universities," *Minerva*, vol. 18, No. 2, summer 1978.

[45] Contrasting the attitude of Americans towards education with that of Europeans, Alexis de Tocqueville, the well-known commentator on American society, noted in 1831: "Everyone I have met up to now, to whatever rank of society they belong, has seemed incapable of imagining that one could doubt the value of education. They never fail to smile when told that this view is not universally accepted in Europe. They agree in thinking that the diffusion of knowledge, useful for all peoples, is absolutely necessary for a free people like their own, where there is not property qualification for voting or for standing for election. That seemed to be an idea taking root in every head." Alexis de Tocqueville, *Journey to America*, translated by George Lawrence, J.P. Meyer (ed.) (New York, NY: Anchor Books, 1971).

[46] As Wayne Rasmussen has described it: "The revolution generated by the Civil War catapulted the nation's farmers not only into a new era of mechanization but also into a world of complex social and economic forces that were too volatile and powerful for individual farmers to confront by themselves. It seemed that the appearance of more complex and productive tools intended to guarantee the farmer's survival had made that survival more complex." Wayne D. Rasmussen and Paul S. Stone, "Toward a Third Agricultural Revolution," in Don. F. Hadwiger and Ross B. Talbot (eds.), *Food Policy and Farm Programs*, proceedings of the Academy of Political Science (New York, NY: The Academy of Political Science, 1982), p. 179.

[47] The idea that knowledge could improve agriculture was first put forward by agricultural societies composed of well-to-do gentlemen farmers, farm journalists, and some educators. Such citizen advocacy was bolstered by public agencies and private agricultural interests that acted in mutually supportive ways. These public agencies included the U.S. Department of Agriculture and the land-grant colleges. The private interests included general farm organizations as well as commodity groups. Rasmussen, 1989, op. cit., footnote 10, pp. 8-22; also David E. Hamilton, "Building the Associative State: The Department of Agriculture and American State-Building," *Agricultural History*, vol. 64, pp. 209-218.

[48] Democratic and populist, the land-grant movement called on the universities to extend the benefits of education to all segments of society. Responding to the Nation's rapid industrial and agricultural development, it called on the universities to expand beyond their traditional role of training gentlemen as preachers, lawyers, and doctors, and—through applied research—to develop the more practical applications of education. Provided under the Morrill Act of 1862, land-grant colleges, open to students of all backgrounds, were established to provide education in fields such as agriculture, engineering, home economics, and business administration. Unlike traditional colleges, land-grant colleges were not isolated communities. Through their agricultural experiment stations and their service bureaus, their activities were designed to serve the State. For a discussion, see Clark Kerr, *The Uses of the University* (Cambridge, MA: Harvard University Press, 1972).

[49] The Hatch Act of 1887 authorized the establishment of agricultural experiment stations to be funded with the proceeds from the sale of certain public lands. In addition, it authorized annual grants of $15,000 for the purpose of testing, research and publication, and dissemination of scientific information under cooperative arrangements between the States and the Department of Agriculture. See Osbourn, op. cit., footnote 7, p. 15.

[50] The Smith-Lever Extension Act of 1914 called for the Government to disseminate among farmers useful information on crop and livestock production, soil management, marketing, and rural sociology that had been produced in the agricultural colleges.

[51] The Smith-Hughes Act of 1917 provided for Federal grants-in-aid to be matched by State contributions for promoting instruction below the college level in agriculture and the trades.

[52] Hadwiger, op. cit., footnote 4.

"demonstration farms," on which farmers could learn by watching and doing, and "movable schools," such as George Washington Carver's Tuskeegee mule-drawn wagons full of new seeds, farm machinery, and dairy equipment, as well as boys' and girls' clubs through which it was hoped parents could be educated.

One promising and widely used idea was to employ an "extension agent" in each county to work directly with innovative farmers. The Smith-Lever Act of 1914 authorized partial Federal funding for an extension service in all rural counties. The costs were to be shared by the States, the counties, and by county organizations of innovative farmers, called farm bureaus. Comanaging this new agency were the U.S. Department of Agriculture and the land-grant agricultural colleges. On the campuses, extension and experiment stations formed a partnership. Still another partnership developed between the county extension agency and the county farm bureaus; the county agent organized the farm bureaus, which in turn formed State and National farm organizations, thereafter becoming Extension's link with political supporters as well as farmers. Later on, extension people helped start other farm organizations, called commodity organizations. The experiment stations also formed links with the farm bureau and with the commodity groups so they could better understand the research needs of producers. Leadership for this public-private network was recruited from graduates of the agricultural colleges. Within a few decades, this elaborate network of players had achieved its goal of modernizing farming. Moreover, the quality of farm life had been improved through access to home economics and other farmer information services.

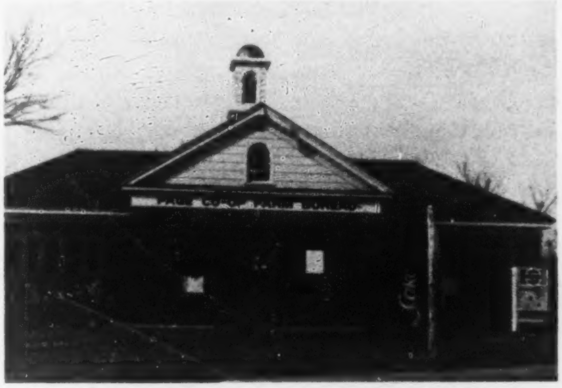

Photo credit: Mark G. Young

The Page Co-op Farm Bureau endures even as the county shifts away from agriculture.

Despite its many successes, the Extension Service has been criticized throughout its history for being elitist, and catering to the most innovative farmers. Moreover, it has found it difficult to move from the goal of agricultural efficiency to the broader goal of community development. Under President Roosevelt, for example, leaders in the Department of Agriculture tried to develop policies aimed at multiple goals. But this initiative was opposed by the farm bureau, which feared that the Extension Service might lose control at the grassroots level.[53] And State extension services found it hard to shift their resources from agricultural to rural development because of the resistance of farm and commodity organizations. Moreover, the partnership between scientists and extension, which was so successful in modernizing agriculture, often opposed efforts to renounce conventional agricultural practices that might endanger health or the environment.[54]

As rural areas face the challenge of moving into the information age, the Federal Government must continue to play a major role in information dissemination, research and development, and education and technology transfer. At present, there is little Federal research being conducted that focuses on the complex relationship between communication technologies and economic development. More is needed to avoid the kind of mistakes made in the past when trying to deploy technology to achieve social or economic ends.[55] There is also a need for assistance in transferring technology to economic development applications and for providing up-to-date information about these technologies.

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[53] Richard Kirkendal, *Social Scientists and Farm Politics in the Age of Roosevelt* (Columbia, MO: University of Missouri Press, 1966), pp. 195-217.

[54] Ibid.

[55] The USDA Economic Research Service (ERS) conducts research on the rural economy, including business, educational, and financial needs of rural development. However, only a very small percentage (about 5 percent, down from 10 percent a decade ago) of ERS's budget is allocated to rural topics, due to budget constraints and competing priorities (the bulk of ERS's research is on agricultural commodities, trade, conservation, and the like). ERS could establish a research focus on rural telecommunication and information services or industries, and on the business, educational, and financial requirements of a robust rural information economy.

Having successfully played these roles in the past, the Cooperative Extension Service (CES) appears uniquely suited to help introduce information-age technologies to rural areas. Knowledge is rarely transferred passively. Moving innovations from development to production is not a one-way process. The experience and understanding of potential users is as important to the process as is expert knowledge. Thus effective technology transfer requires outreach programs based on mutual trust and respect, similar to those administered by the Cooperative Extension Service.[56]

At present, CES provides education, information, and technology transfer on numerous topics relevant to farming and agriculture generally. The scope extends to many topics relevant to rural development, and could be further broadened to specifically include information technology applications for rural development. CES has the advantage of an extensive State and county network of land-grant colleges, extension agents, and field experiment stations through which to disseminate information and education.

CES has interpreted its statutory mandate as extending to the general health of rural America, and has now developed its own rural development strategy, in coordination with U.S. Department of Agriculture and government-wide rural revitalization initiatives.[57] Indeed, the CES rural strategy predates these other initiatives. The CES approach to rural development emphasizes the importance of local leadership, the health of the local community, a well-educated rural citizenry, and strong cooperation among governmental and private sector participants in the development process.[58]

CES is developing a communication and information technologies strategy, to be completed by early 1991. The strategy could serve as a vehicle to focus USDA and perhaps government-wide efforts for technology transfer in rural areas. CES is already experimenting with the use of electronic media—including online databases, compact optical disks, videodisks, videoconferencing, and computer networking—to carry out its education and information dissemination functions.

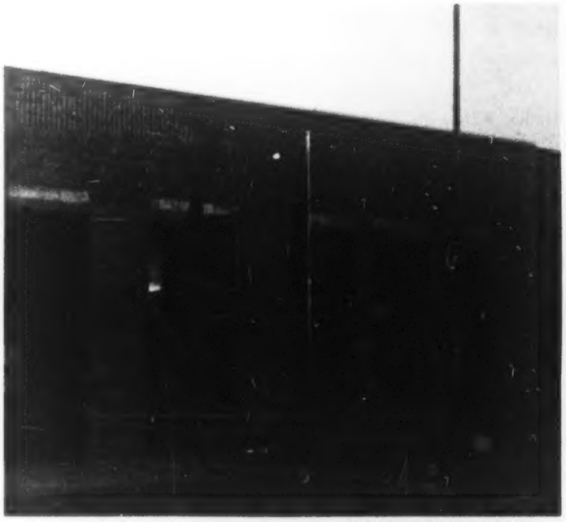

Photo credit: Mark G. Young

The Pend Oreille County Library, led by its energetic and visionary director, is a major information center for the town of Newport, WA.

CES also cosponsors (with the National Agricultural Library) a Rural Information Center (RIC) that provides information retrieval and rural information briefs. Eventually, RIC will provide local follow-up through county extension agencies and database access in local offices. RIC now includes a Rural Health Information Clearinghouse Service through an interagency agreement with the Department of Health and Human Services. The concept is being extended to other categories of rural information.

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[56] Abbe Moshowitz, "Cooperative Extension: A Functional Model for Technology Transfer and Economic Development in Rural America," contractor report prepared for the Office of Technology Assessment, May 1990.

[57] See, for example, U.S. Department of Agriculture, Cooperative Extension Service, *Revitalizing Rural America: A Cooperative Extension Service Response*, November 1986; special issue on "Rural Revitalization," *Extension Review*, Winter 1987; and "Revitalizing Rural America: Critical Issues & Cooperative Extension System Response," no date. Also see Northeast Regional Center for Rural Development, *New Alliances for Rural Economic Development: Colloquium Proceedings*, co-sponsored by USDA and the National Association of State Universities and Land Grant Colleges (University Park, PA: Northeast Center for Rural Development, Pennsylvania State University, February 1989); Northeast Regional Center for Rural Development, *Cooperative Extension and New Alliances for Rural Economic Development: Five Case Studies*, prepared in conjunction with the USDA Extension Service (University Park, PA: Northeast Regional Center for Rural Development, Pennsylvania State University, November 1989); and University of Missouri Extension Service, *Extension Responds to the Rural Crisis*, prepared in conjunction with the university extension services of Iowa, Kansas, Mississippi, Missouri, Nebraska, North Dakota, Oklahoma, and Vermont (Columbia, MO: University of Missouri Extension Service, July 1990).

[58] CES has a history of cooperation with other groups and agencies. For example, CES has an interagency memorandum of understanding with the Small Business Administration for the exchange of information and expertise on training rural small business managers.

If CES is to be truly effective in carrying out these tasks, it will need to upgrade its public image. Especially at the local level, it is still often thought of as a "worn out" agency, focused on agriculture to the exclusion of other kinds of development problems. Moreover, although Federal Extension Service officials are now more aware of the potential role for telecommunication technologies in the development process, there is still a large knowledge gap at the local level. Thus, if CES is to play an expanded role in introducing information-age technology in rural areas, it must be reenergized and develop greater technical expertise.

The Rural Economic Development Act of 1990 takes steps to enhance the role of the Cooperative Extension Service. Section 2346 establishes a rural economic and business development program within the Extension Service. Funds are provided for State and county-level CES rural development specialists to:

> . . . assist individuals in creating new businesses, including cooperatives, or assist existing businesses, and to assist such businesses regarding advanced telecommunications, computer technologies, technical or management assistance, business and financial planning, and other related matters, and to assist community leaders in community economic analysis and strategic planning.

Rural development specialists would:

> . . . provide advanced telecommunications, business management, computer operations, and other technical assistance to community leaders and private sector entrepreneurs and cooperatives.

The Extension Service is also directed to coordinate and cooperate with any similar service provided by other Federal agencies or programs.

Coordinating Federal Roles for Holistic Rural Development

Just as cooperation among local participants is critical to the success of a rural development program, so too is cooperation among Federal players. In fact, Federal coordination will facilitate local cooperation. Moreover, budgetary constraints make intragovernmental program coordination mandatory since money to create new agencies is scarce.

A holistic rural economic development strategy requires that many Federal agencies and programs be involved. Using communications technologies as a fundamental and uniting element of holistic rural development means that Federal players who previously had no reason to consider rural development must now take part along side the vast array of players involved already.

Federal Players

Over the decades, Congress and the executive branch have established hundreds of programs that contribute to rural development. Many were designed to carry out broad national objectives—such as retraining dislocated workers or rehabilitating deteriorated housing. They applied to all geographic places—urban, suburban, and rural alike. Other programs, such as REA and CES, were targeted primarily at rural concerns (see figure 6-1).

The complexity and magnitude of Federal involvement in rural issues are illustrated by the U.S. General Accounting Office's effort to catalog Federal grants, loans, and direct payments to rural America (see box 6-B).[59] GAO identified hundreds of programs, spread over the following categories:

- economic development,
- agricultural/natural resources,
- infrastructure,
- human resources,
- general entitlement, and
- special entitlement.

Intragovernmental Coordination

Even this brief examination of Federal programs affecting rural development reveals a complex web of agencies and activities. There is no overarching policy or clear direction to these efforts; each program reflects a partial strategy.[60] With so many different agencies and so many different programs

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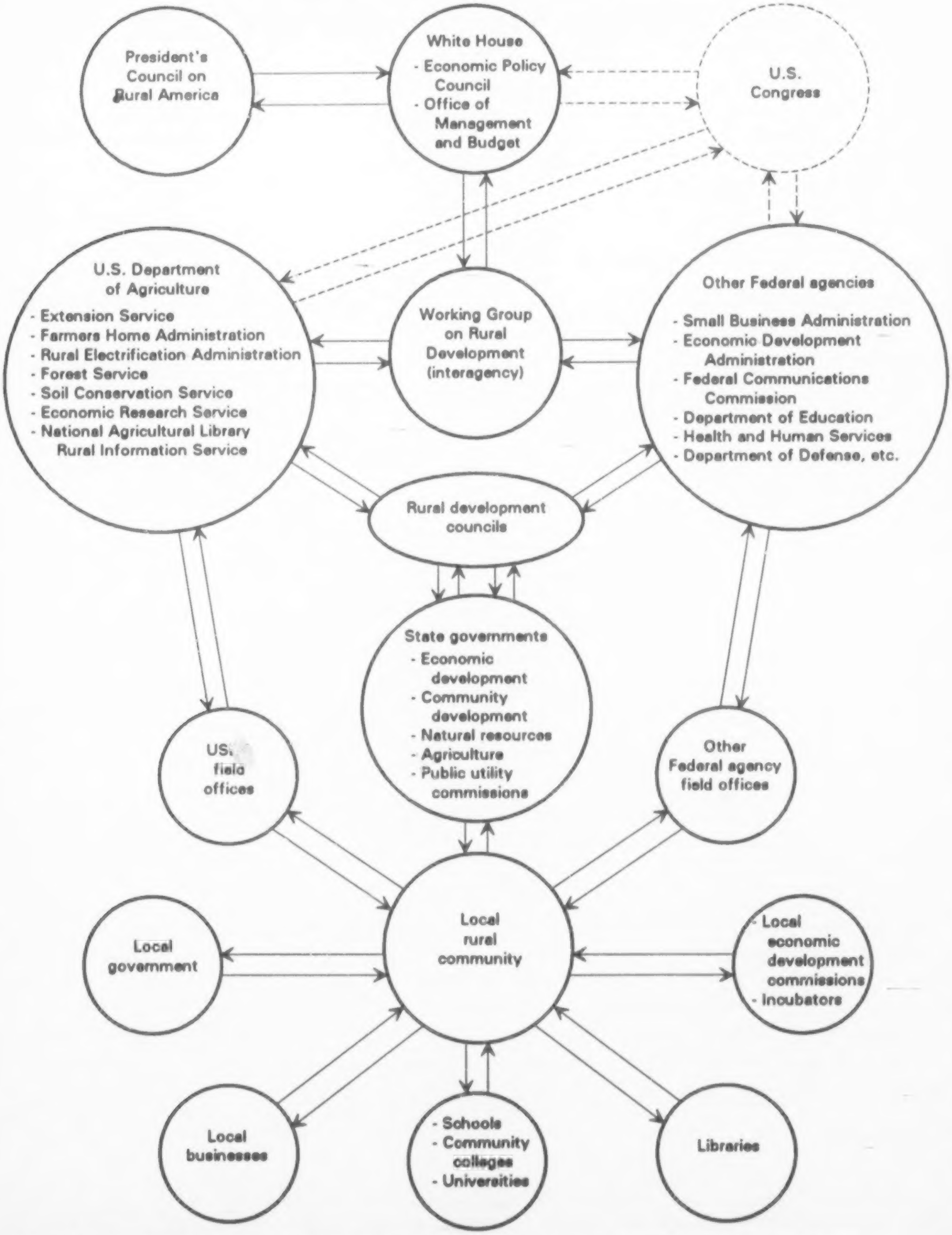
[59] U.S. General Accounting Office, *Rural Development: Federal Programs That Focus on Rural America and Its Economic Development*, briefing report to the Ranking Minority Member, Subcommittee on Conservation, Credit, and Rural Development, Committee on Agriculture, U.S. House of Representatives, GAO/RCED-89-56BR, January 1989.

[60] As Richard Long et al. explain, "The existing coordination within the Federal Government among policies and programs affecting rural development is generally due more to chance than to intentions." Richard W. Long, J. Norman Reid, and Kenneth L. Deavers, *Rural Policy Formulation in the United States* (Washington, DC: USDA Economic Research Service, Agriculture and Rural Economics Division, April 1987), p. 27. And USDA officials and advisory groups concur that there is, at present, no coordinated governmentwide rural development policy.

Figure 6-1—Organizational Chart of Agencies Involved with Rural Development


President's Council on Rural America
White House
- Economic Policy Council
- Office of Management and Budget
U.S. Congress
U.S. Department of Agriculture
- Extension Service
- Farmers Home Administration
- Rural Electrification Administration
- Forest Service
- Soil Conservation Service
- Economic Research Service
- National Agricultural Library Rural Information Service
Working Group on Rural Development (interagency)
Other Federal agencies
- Small Business Administration
- Economic Development Administration
- Federal Communications Commission
- Department of Education
- Health and Human Services
- Department of Defense, etc.
Rural development councils
State governments
- Economic development
- Community development
- Natural resources
- Agriculture
- Public utility commissions
US[illegible] field offices
Other Federal agency field offices
Local rural community
Local government
- Local economic development commissions
- Incubators
Local businesses
- Schools
- Community colleges
- Universities
Libraries

The key players involved in rural development at the Federal, State, and local level, and how they relate to each other.

SOURCE: Office of Technology Assessment, 1991.

Box 6-B—Federal Roles in Rural Development

Using the functional categories provided by the General Accounting Office (GAO), it is illustrative to examine the focus of each category and list important programs.

Economic Development

GAO identified 29 Federal programs directed at economic development. Rural regions received 18 percent of the $4.2 billion of funding from these 29 programs. Many of the government's economic development programs focus on small business development.

The U.S. Department of Agriculture has been allocated the lead role in Federal rural development policy because many USDA bureaus and programs serve rural America. Within USDA, the most active economic development program is the Farmers Home Administration (FmHA). FmHA distributes assistance to rural areas through business loans and industrial grant programs. It focuses on job creation, rather than on promoting particular industries. FmHA also provides loans for community facilities and for farmers.[1] The Department of Agriculture also sponsors the Business and Industrial Loans program, which issues guaranteed loans.

The Department of Commerce's (DOC) Small Business Administration (SBA) and Economic Development Administration (EDA) each have numerous programs directed toward small business development in rural areas. About half of EDA grants are awarded to rural areas (as defined by GAO—counties with under 20,000 population outside metropolitan areas). EDA grants fund projects ranging from local revolving loan pools and industrial infrastructure projects to grants for local planning activities. SBA provides loans to individual businesses, small business investment and development companies, and State/local development companies; grants to small business development centers; and technical assistance to disadvantaged small businesses. According to GAO, SBA allocated about 17 percent of its resources to rural areas. The Department of Defense (DoD) also plays a role in rural economic development through its grants for Procurement Technical Assistance for Business Firms.

Agriculture/Natural Resources

In addition to the extensive Federal programs aimed at agricultural commodities price supports, the Federal Government provides assistance to rural areas through its forestry and mining programs, which provided about $84 million in grants and payments in 1987. USDA administers the largest of the forestry projects. These programs provide grants and direct payments to encourage forest resource management, increased timber production, and the efficient use of wood and wood residues. The Department of the Interior (DOI) participates in rural development through its program for regulating surface mining.

Infrastructure

GAO lists 30 Federal programs that provide aid for rural infrastructure development, which include programs for community facilities, transportation, utilities, and public works. Nine agencies allocated $11.1 billion in grants, payments, loans, and other expenditures for such projects. The Department of Housing and Urban Development (HUD) administers several infrastructure programs, but it is unclear how much HUD funding goes specifically toward rural areas. USDA, through its roads projects, water and resource conservation projects, REA, and Rural Telephone Banks, participates extensively in rural infrastructure development. DOI, through its outdoor recreation programs, and the Department of Education (DOE), through educational facilities and library construction projects, also play significant roles in rural infrastructure development. Additionally, The Department of Transportation and the Appalachian Regional Commission (ARC) each offer extensive highway construction and improvement funding, which contribute to rural development. DoD participates in rural infrastructure development through its Corps of Civil Engineers Work Programs.

Human Resources

Rural areas benefit from a variety of Federal programs for human resource development, most of which have no specific rural orientation. GAO lists 36 programs, administered by 8 different Federal agencies, that provide about $13.6 billion in aid to rural areas. The Department of Health and Human Services provides funding for several national programs, such as community services projects, Head Start, and Migrant Health Centers. DOE offers rural assistance through vocational and general education grants, which are not rural-targeted. USDA's Cooperative Extension Service offers several grants for vocational education, but rural areas only receive about 6 percent of CES funding for these purposes.[2] USDA also offers several housing assistance programs, which primarily benefit rural communities. The Department of Labor administers several worker training and retraining programs, along with its programs to assist dislocated workers. Given the changing nature of the rural economy, these programs will likely have continuing and growing importance for rural America. ARC offers small health and education programs, and HUD provides property improvement loan insurance.

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[1] Eligible community facilities include libraries, schools, town halls, community centers (if not used primarily for recreation), hospitals or medical clinics, and fire/emergency rescue stations. FmHA does not at present target or encourage funding for information technology, but computers and telecommunications equipment would be eligible if included as an integral part of community facilities. In certain cases, such as emergency, fire, police, and medical systems, computer systems have been considered to be community facilities and funded directly.

General and Special Entitlement Programs

To the extent that people living in rural areas are eligible for the Federal Government's various entitlements programs, these programs affect rural development. None has a specific rural orientation. However, demographic trends would indicate that programs directed at the elderly, such as social security, Medicare, and retirement programs, would have a proportionally larger impact on rural areas due to their greater proportion of elderly. Similarly, programs aimed at coal miners and Native Americans would tend to have a greater impact on rural areas. In addition to these programs, rural areas also benefit from the Federal Government's public assistance programs, food stamps, Veterans assistance programs, and railroad workers programs.

Information Dissemination and the Promotion of Technological Applications

The Federal Depository Library Program is an important rural resource. Many of the 1,400 participating libraries are located at colleges and universities in small towns surrounded by predominantly rural areas. The U.S. Postal Service is also an important source of information dissemination and increasingly promotes information technology applications. More than half of all post offices are located in rural areas, and some now provide their communities with access to facsimile machines and electronic mail boxes.

New Players

If the Federal Government makes as a priority the use of communications technologies as a fundamental link in rural development, new governmental players must become involved in Federal efforts. As the national regulator of telecommunications, the Federal Communications Commission (FCC) will have to consider how its various policies affect rural development. FCC can also become involved in rural development issues through the Federal/State Joint Board. DOC's National Telecommunications and Information Administration, as the Administration's telecommunications advisory body, must also take a broader approach to examining telecommunications issues, to include their impact on economic development in general and on rural development in particular.

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[2] According to GAO, despite CES' rural charter, the majority of its funding does not go to rural communities because program funds are administered to the land-grant colleges, which are generally not in counties designated as rural. Although the colleges themselves are typically not located in rural-classified counties, much extension work targets rural communities.

SOURCE: U.S. General Accounting Office, *Rural Development: Federal Programs That Focus on Rural America and Its Economic Development*, briefing report to the Ranking Minority Member, Subcommittee on Conservation, Credit, and Rural Development, Committee on Agriculture, U.S. House of Representatives, GAO/RCED-89-56BR, January 1989.

within each administering agency, both inter- and intra-agency program coordination is necessary. But it will not be easy, as "coordination is rarely neutral."[61] To accomplish such coordination, a national strategy and statement of intent is essential.[62]

The Federal Government has attempted various degrees of policy coordination and integration.[63] Eisenhower's Rural Development Program was one of the first efforts to address rural development from a multifaceted perspective. It was not until the Carter Administration's Rural Development Policy Act of

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[61] Harold Seidman explains, "to the extent that [cooperation] results in mutual agreement or a decision on some policy, course of action, or inaction, inevitable it advances some interests at the expense of others or more than others." Harold Seidman, *Politics, Position, and Power: The Dynamics of Federal Organization* (New York, NY: Oxford University Press, 1980).

[62] Ibid. Seidman goes on to explain that, "if agencies are to work together harmoniously, they must share at least some community of interests about basic goals. Without such a community of interests and compatible objectives, problems cannot be resolved by coordination."

[63] Long et al., op. cit., footnote 60, p. vi.

1980, however, that a comprehensive national rural policy was formulated. The Carter policy set four goals:

1. meeting the basic human needs of rural Americans,
2. providing opportunities for rural people to be fully and productively employed and providing a favorable climate for business and economic development,
3. addressing the rural problems of distance and size, and
4. promoting the responsible use and stewardship of rural America's natural resources and environment while preserving the quality of rural life.[64]

The Act included an Action Agenda with 200 specific programmatic actions, along with recommendations for strategies to develop the institutional capacity necessary for policy implementation. Despite its well-studied and comprehensive approach, however, the Carter policy did not make a strong impact on rural problems. Critics contended that it was ineffectual because, among other things, it:

- did not increase resources for rural development;
- did not rank in priority the 200 items on the Action Agenda;
- merely fine-tuned the existing system, instead of making systemic changes; and
- was highly dependent on the efforts of a few key individuals, failing to develop sufficient influence with political and budgetary decisionmakers.[65]

The Rural Development Act of 1980 is instructive both for its successes and its failures. Praising it for its comprehensiveness, observers view the Act as "a basis on which to build."[66] Its shortcomings suggest that nominal commitment is not enough. To be successful, a rural policy must be backed by the political and financial will of the Federal Government.

Federal Policy Execution

If the Federal Government takes a holistic approach to rural development, the problem of coordination will need to be addressed from a functional, rather than an agency, perspective. To date, most rural development strategies have reflected the missions of various government agencies.

This division of responsibility along agency lines helps account for the limited contact between Federal telecommunication regulators and agency officials involved in rural development. The REA, with its historical legacy of successful rural development and its technological orientation, could play an important role in providing more cross-agency fertilization. In addition to the increased responsibilities granted to REA in the Rural Economic Development Act of 1990, the REA could be charged with acquainting Federal telecommunication policymakers with rural development concerns.

The Cooperative Extension Service could also play a coordinating role. The need for technology transfer and an educational component within a development strategy underscores the importance of integrating technological applications into workforce education programs, vocational programs, and general education programs. From its inception, the CES has provided technology transfer. With its ties to educational institutions, CES could coordinate the technology and educational components of any Federal rural strategy.

Bringing together all the various communities involved in rural development—from health care and community services to local business development—will require a more broadly based coordinating body, connecting the various Federal agencies as well as State and local governing bodies and organizations. The current Administration has taken initial steps in this direction by formalizing its Working Group on Rural Development into an interagency committee as part of the presidential initiative on rural development.[67] With representatives of all cabinet departments (except Defense and Energy), the Small Business Administration, Office of Management and Budget, Council of Economic Advisers, and various White House offices, this committee has the potential to crosscut many rural development issues. However, the committee emphasizes the economic and business dimensions of rural development, overlooking key human and social dimensions as well as the role of information technologies. Nonetheless, its existence and breadth of representation signal much potential for policy coordination.[68] Moreover, the committee has plans to establish Rural Development Councils in each State, starting with councils now being implemented in 8 pilot States, and eventually extending to all 50 States if the experiments prove successful. The State councils are intended to coordinate Federal activities at the State level, respond to State and local rural development needs, and strengthen Federal/State/local partnerships in rural revitalization. The councils include representatives from all major Federal agencies providing rural development programs to the States, and are staffed by a full-time rural development coordinator (who is a Federal employee from one of the participating agencies).

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[64] Osbourn, op. cit., footnote 7, p. 24.

[65] Ibid., p. 25.

[66] Ronald C. Powers and Edward O. Moe, "The Policy Context for Rural-Oriented Research," Don A. Dillman and Daryl J. Hobbs (eds.), *Rural Society in the United States: Issues for the 1980s* (Boulder, CO: Westview Press, 1982), p. 14. Cited in Sandra Osbourn, ibid.

[67] Economic Policy Council, Working Group on Rural Development, *Rural Economic Development for the 90s: A Presidential Initiative* (Washington, DC: The White House, January 1990).

The Rural Development Councils in turn will coordinate a series of rural development demonstration projects. These projects will target Federal resources into specific rural areas to meet defined needs in ways that encourage more coordinated, synergistic, responsive Federal assistance. These projects are intended to have both a local option and evaluation component. The purpose is to encourage innovation but in ways that protect local flexibility and choice, and ensure that the project results can be measured. Projects that work well can be replicated or adapted in other rural areas.

Also, as part of the Presidential initiative, the Rural Information Center, operated by the National Agricultural Library, is being upgraded to include a wider range of information and technical assistance on Federal rural assistance programs. And a Presidential Council on Rural America has been established to provide a high forum for rural development issues and a means to bring rural policy proposals into focus for the President and senior White House and agency officials. The Council has representation from State and local governments, not-for-profit organizations, small business, and a variety of industries relevant to the rural economy.

Finally, the USDA has been designed as the de facto lead agency for rural development, by virtue of the designation of the Secretary of Agriculture as chairman of the interagency coordinating committee and the President's Council. Many Federal agencies have programs that affect rural America; but USDA has by far the heaviest concentration of rural-relevant activities. USDA has appointed an Assistant Under Secretary for Rural Development, and supported the establishment of a Rural Development Administration within USDA.

Cooperating in Pursuit of Change

Undertaking any new approach has the potential for conflict. It entails giving up some things to gain others. Some individuals and groups will win; others will lose. New rural development approaches are no exception. Introducing information-age technologies into the rural development process will be especially difficult. These technologies have profound effects. They serve not only as a more efficient means of providing traditional service but also as a catalyst for innovation—for actually changing the way that things get done. Communication and information technologies also have their own mystiques; they can be very intimidating to the uninitiated.

How well information-age technologies can be integrated into economic development strategies will depend on how they are perceived by the key players. If the Federal Government is to successfully encourage the use of these technologies, it will need a clear picture of who these key players are; their relationship to one another; and their needs and aspirations.

The States as Agents of Development

Not since the pre-Civil War days of Jefferson and Jackson have the States been such important players in economic development. Their enhanced role stems both from the Federal Government's withdrawal in this area as well as from the recognition by State governments that if they are to successfully cope with the crises in their economies, they need to

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[68] White House sponsorship of the interagency committee signals that "rural development" is an important issue that deserves high-level executive branch attention; stimulates Federal agencies to at least pay more attention to their roles in assisting rural development; and (combined with related legislative activity in Congress) gives visibility and support to rural development advocates in the executive agencies.

take a more entrepreneurial approach.[69] In a political climate such as this, the States will [illegible] critical in determining whether and how commu[illegible] technologies are used in the rural development process.

The Federal Government first sought to disengage from rural development during the Nixon Administration. While supporting the overall goal of development, President Nixon believed its execution was the responsibility of the States.[70] Accordingly, he proposed legislation to consolidate 11 programs into a single rural development revenue sharing fund to be allocated by the States according to a formula. Congress, however, failed to approve this plan.

President Reagan was much more successful in decentralizing responsibility. He was opposed to a Federal rural policy as such, believing that all communities would benefit if Federal barriers to State, local, and private action were removed. In keeping with this "new federalism," the Reagan Administration challenged all of the ongoing Federal development programs. While the Administration could not eliminate these programs and the agencies supporting them, it did significantly reduce their Federal resources.[71]

The States acted quickly to fill this policy gap.[72] Taking on a new "entrepreneurial" role, they aggressively sought to encourage local economic development. Some States have even gone so far as to subsidize and co-invest in business ventures.[73] Whereas in the past, States tried to encourage development by importing businesses from afar, now they are trying more to create a national, and even global, demand for their local products and services.[74] This is a major shift in their development strategies, and it requires a more activist State role.[75]

Many States are also beginning to view telecommunications as an important development tool. Since 1982, 29 States have adopted legislation pertaining to telecommunications, some for the purpose of enhancing their development potential. A number of States—including among them New York, California, Maine, Minnesota, Michigan, Tennessee, and New Jersey—have commissioned studies and task forces to ascertain the potential of telecommunications for economic development.[76] State policies can only go so far, however, because State governments are limited in their telecommunication expertise.[77]

Active State participation and support will be essential to any Federal program intended to encourage telecommunication-based rural economic development. It is at this jurisdictional level that many development programs are coordinated and priorities met. Moreover, it is the State public utility commission that sets regulatory policies affecting rural economic development. Thus, it will be State governments that have to reconcile economic development and regulatory policies and goals. State governments also help develop the States' infrastructures. Increasingly, this set of activities is coming to include communication networks. As major users of telecommunication services, the States can leverage their market power on behalf of rural development. In addition, they can lead the way by using telecommunications to provide information and social services. Bringing State governments into the process will help assure their commitment to Federal programs. Many States are now in the process of devising comprehensive statewide development plans.[78] Acceptance of telecommunication-based approaches will be more likely if they are incorporated early into these plans.

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[69] See for discussions, Peter K. Eisinger, *The Rise of the Entrepreneurial State: State and Local Development Policies in the United States* (Madison, WI: University of Wisconsin Press, 1988); and David Osbourn, *Laboratories of Democracy* (Boston, MA: Harvard Business School Press, 1988).

[70] As Sandra Osbourn points out, "Nixon made it clear that the goal of establishing a sound balance between urban and rural America would be carried out in accordance with the requirement of a second goal: '. . .the restoration of the right balance between the State capitals and the national capital.'" Osbourn, op. cit., footnote 7, p. 46.

[71] Eisinger, op. cit., footnote 69, p. 85.

[72] The States first became involved in economic development in the period following the Great Depression. Many Southern States in particular tried to induce businesses to their areas with offers of land, cheap labor and capital, and tax benefits.

[73] Many States use a variety of small business management and investment programs to upgrade the quality of rural business management and improve the prospects for financing small business expansions or new starts. These programs are typically offered through extension services, economic development organizations, and small business development centers at community colleges and universities. An important function of these programs is to disseminate information on market opportunities, competitive activities, new technical or management techniques, and sources of financing. Computerized databases can be of immense value, for example, to locate the results of product or market research on organic agriculture, match rural entrepreneurs with urban or suburban investors, and track trends in exports and imports of forest products.

[74] State-funded computerized databases provide a very highly leveraged way to interconnect rural economies with the national and even global economies. Some States are consciously working to build bridges between rural products and services and urban (and foreign) markets. This can take the form of urban-rural buyer-supplier agreements, regional public-private rural-urban partnerships, domestic-foreign joint ventures, export trading consortia for smaller firms, and the like. The rural economy is viewed not in isolation but in terms of how it can add unique value and capitalize on market sectors where rural activities can be competitive. This new approach to rural development requires much greater volumes and quality of information about competitive activities and opportunities, and on a timely basis. Online and ondisk electronic information systems can help make this a reality.

[75] Eisinger, op. cit., footnote 69.

[76] Paul Eric Teske, *After Divestiture: The Political Economy of State Telecommunications Regulation* (Albany, NY: State University of New York Press, 1990).

[77] As Heather Hudson points out, 27 States have no professionals working on telecommunications. The average number of telecommunications experts in the remaining States is between 1 and 2. See Heather Hudson, "Telecommunications Policy: The State Role, A National Overview," paper presented to the 18th Annual Telecommunications Policy Conference, Airlie, VA, October 1990.

Gaining State support for a Federal program will require establishing appropriate Federal/State institutional arrangements. The trend of late has been to distribute Federal funds using block grants. This approach is very popular with State governments. It provides maximum flexibility, allowing programs to be tailored to the particular needs of a State. It also provides for diversity, and the learning that comes from using different approaches.

There are, however, problems with this approach. The more that responsibility is shifted to the States, the more difficult it will be for the Federal Government to mount a major campaign, assert program control, or set national priorities. In particular, this approach would make it hard to assure a holistic development strategy that takes maximum advantage of new technological opportunities. Often States governments focus their development policies exclusively on the business sector, and thus on the regions of their States that offer the most promise in this regard. Moreover, officials in many States are not well versed in the use of technology for development purposes, nor aware of the new opportunities and choices that it presents.

If Federal funds were distributed through State governments or State economic development boards, it would be important to assure that they had the technical capacity to make educated decisions about its use. Moreover, some conditions might need to be set to assure that Federal goals were met. For example, it might be necessary to set aside a certain portion of funding for small, very isolated communities.

Photo credit: Mark G. Young

Hospitals, such as this one in Culpeper, VA, are important resources for rural economic development.

An alternative way of achieving flexibility at the State and local levels is to work through the Cooperative Extension Service. CES already has administrative units in all jurisdictions. And program activities vary from State to State. Subject-matter specialists, who are usually employed by a land-grant institution, aid county agents in the development of technical information; supervisors and State leaders assist in program planning, budgeting, and public relations. The role of the Federal Government is largely one of consultation and leadership rather than direct management or control.

Vision and Leadership at the Local Level

The local community is key to the success of rural development. Whatever the larger national interest in a strong rural America, the people directly affected are those living and working in rural areas. If rural education is to be strengthened, rural jobs created, rural health care improved, these changes will happen because rural citizens are motivated and

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[78] The focus of State leadership will vary, and might include State economic development departments, State rural policy offices where they exist, State public utility commissions, and various statewide economic development councils and commissions. An effective State rural development planning office needs the support of the Governor, access to and cooperation from relevant State agencies and the State legislature, good rapport with local rural communities, and sensitivity to the need for local leadership and implementation.

Box 6-C—Livermore, KY

The importance of energetic, visionary, and dedicated leadership is especially important for economic development in rural areas. Without local leadership, the presence of good roads, sophisticated communications, and quality education can accomplish only so much. Even without such underpinnings for a healthy economy, inspired leadership can go a long way in surmounting such obstacles. Such is the case in Livermore, KY, where the mayor has steered the community through the difficult years of a protracted recession.

Livermore is a small community of about 1,700 people in the western coalfield region of Kentucky. It lies on the banks of the Green River and is even passed by fiber optic wires though, as yet, the community has not yet been able to tap this resource. Livermore's economy struggles because several miles of county roads separate the town from any significant transportation arteries. Like many struggling rural areas, Livermore's economic straits are also related to its poor educational system, which drives away those with high aspirations for their families. Another problem is the difficulty in securing financing for small businesses.

Mayor Amber Henton is reknowned throughout much of the State for her efforts on behalf of Livermore. "Firecracker" and "livewire" were two adjectives used to describe her. She started out with the Federal Government during World War II before moving on to local politics, and this long experience as a civil servant, along with her savvy, is perhaps Livermore's most valuable asset. With her deep understanding of Federal and State bureaucracies, Mayor Henton musters all available financial and material resources to secure important services for the town. Among her accomplishments, Livermore has constructed housing for senior citizens and is building a 10-acre industrial park along with a 10-acre recreational facility.

SOURCE: Office of Technology Assessment site visit, January 1990.

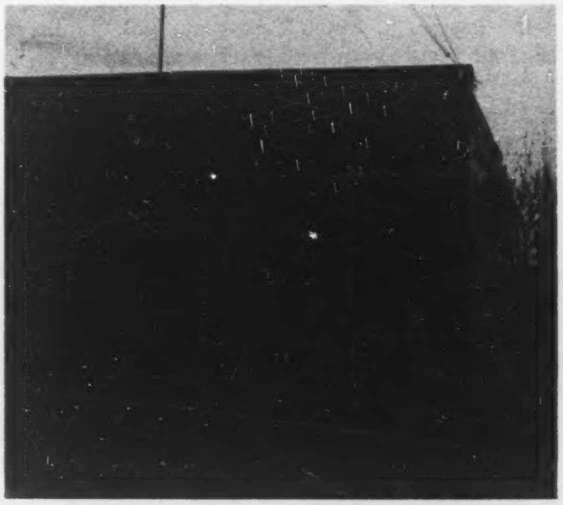

Photo credit: Mark G. Young

Mayor Henton's storefront office in Livermore.

have the skills and resources necessary to make rural development succeed.

Local communities in most rural areas are not presently equipped to provide leadership on comprehensive rural development in general or information technology in particular. Rural town and county governing bodies typically focus on meeting community infrastructure needs such as roads, schools, fire/medical facilities, water, and sewage. Many rural jurisdictions are hard pressed to meet even these basic needs, and do not have the staff or resources to undertake a broad-gauged economic development program. Many local governments are hindered by a piecemeal, narrow view of development, which is aggravated by competition over scarce resources and a general lack of awareness of the potential of information technology.[79] In sharp contrast, most urban and suburban jurisdictions have fully staffed and funded economic development departments.

To take advantage of information-age technologies, rural communities need visionaries and activists. Visionaries can help local communities understand what telecommunications and computers can do and translate the technical possibilities into the every day life of rural citizens. Leaders and activists are necessary to implement these ideas[80] (see box 6-C).

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[79] In the more affluent cities and suburban areas, economic development programs are robust enough to include local trade missions to foreign countries, zoning and architectural requirements that ensure high-quality local construction, and provision of child care, adult education, and recreational programs as important adjuncts to a healthy local community and economy. Local governments in affluent metropolitan areas are usually heavy users of information technology at least for office automation and management purposes, and have access to extensive technical expertise both inhouse and from telephone and cable companies, computer retailers, and systems integrators, among others, who are selling to the local market. And in the major metropolitan areas, the opportunities to learn about telecommunications and computer are overwhelming. High schools, community colleges, local universities, vendors, and professional associations offer a potpourri of classes, seminars, and mini- to full-length educational programs on information technologies.

Visionaries come from many places. Institutions of higher education provide one important source. Many colleges and universities already have computer/communication networks that are electronically linked to other institutions, libraries, and databases, and research centers throughout the United States and even the world. The future development of a high-speed national research and educational network (NREN) will provide universities even greater access to computing and transmission capacity, and information services. In addition, the number of educational institutions using communication technologies to develop and share educational resources and materials is growing at a steady pace. Many colleges now deliver at least some classes over the air or online to students at distant locations.[81]

Having established their own communication networks, and successfully used them to meet their educational goals, educational institutions are knowledgeable in the use of communication technologies. As large users of communication services—often ranking second only to State government—they exert considerable market power. As in the case of a large business, the demand of a statewide university system can, by itself, justify the deployment of advanced technology even to a relatively remote area. Because of these strengths, educational institutions can play a key role in assuring the success of telecommunication-based development programs. Not only could they provide expertise, they could also leverage their market power to draw communication providers to rural areas.

Colleges and universities also provide a locus for many of the key players involved in development.

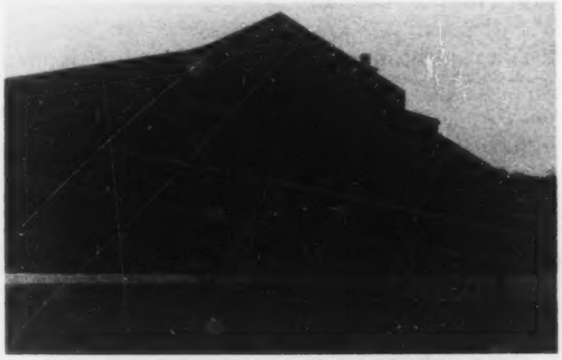

Photo credit: Mark G. Young

Owensboro Community College's Resource Learning Center in Kentucky. OCC, in conjunction with the local government, plans to employ telecommunications for a variety of social, cultural, and economic functions.

Businesses are now aligning themselves with educational centers to promote education, training, and research. They are also taking advantage of university online library systems and the growing number of applied research and development centers located at, or near, university centers. Similarly, many organizations involved in development are either housed at or near the university. For example, the Small Business Administration's offices are generally located on university campuses. So too are many Extension Service offices. Universities and colleges are also well connected to State governments, since many are governed by State boards and funded by the States. Thus, State systems of higher education could provide an impetus to the rural economic development process. Federal and State programs that do not provide a role for them will lose a powerful resource.

Another source of vision is the library community. Libraries are, by their very nature, in the information business. The larger public libraries and most college and university libraries already use information technology. It is not uncommon now for even small town college libraries to use both online and compact disk systems to search bibliographic databases. The library community as a whole is quite well organized and aware of the opportunities and challenges presented by electronic technologies. The challenge is to extend this energy and expertise to libraries and library users in rural America. This is already happening in some college towns and county libraries. But most rural libraries do not, at present, have adequate resources to provide leadership.[82]

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[80] Successful long-term rural revitalization requires a commitment to developing leadership. This means providing opportunities for current leaders to expand their horizons, acquire or strengthen leadership skills, and learn more about the opportunities and challenges presented by emerging information technologies. This also means identifying persons with future leadership potential and providing them with the experience and training to build leadership capacity. Community colleges, small town state universities, professional associations, and Federal/State extension programs, among others, can all help bring special courses, seminars, and workshops to local leaders. These training activities can run the gamut from community organizing and coalition-building to fund raising to effective use of telecommunications and computers.

[81] College-based activities run the gamut from sponsoring special courses or seminars on telecommunications and rural development, to adding a rural development focus to existing courses (e.g., in agriculture, forestry, and business), and to conducting research (perhaps with Federal, State, and private sector funding) on rural development. Also, interested college and university faculty members are more likely to get involved in rural development as private citizens and thus provide visionary leadership in the community as well as the classroom. College and university students are a still largely untapped resource. Faculty members can encourage student involvement in rural development issues by including site visits, field projects, user surveys, and the like as part of the curricula.

Vision and leadership can also come from rural business communities. Businesses participate in local economic development programs through organizations such as their local chamber of commerce and their local Economic Development Administration (EDA) office. The quality and resources of such organizations vary considerably from place to place, as does their focus on telecommunications.[83] As local businesses become more dependent on communication technologies, they will likely be more active in promoting technology deployment. However, when businesses view telecommunications as the harbinger of greater competition, they are often opposed to change.

If rural communities are to use telecommunications effectively, these visionaries cannot operate alone. They need to find common solutions to their diverse problems, given their limited size and scope. Such cooperation, however, may not be forthcoming. Although communication-based economic development programs are likely to have considerable long-term benefits, many stakeholders will feel threatened by such programs. Agency officials, at all levels, may try to protect their turfs, or be unwilling to gain the expertise needed for effective program implementation. Telephone service providers might be concerned that users, acting in concert, bypass their communication systems. State development officials may resent loss of control over development funding. Local development groups may resist newcomers seeking a share of development funding. An important role for the Federal Government, therefore, is to promote cooperation through incentives in the forms of grants and loans.

Educators have taken the lead in developing this kind of an approach. Under the Star School Program, for example, $33.5 million (in the form of 2-year grants) was provided on a competitive basis to partnerships set up to develop systems and programs for long-distance learning.[84] States must match the grant by at least 25 percent. These programs are intended to become self-sustaining. Taking advantage of a somewhat similar opportunity, the University of Maine/Telecommunications System used a 5-year, $4.4 million grant provided by the Department of Education under title III of the Higher Education Act, and matched by the State government, to help telephone providers pay for the upfront costs of deploying a fiber network linking universities and community colleges throughout the State.[85]

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[82] Federal and State governments can play a key role here, through funding and technical assistance to rural libraries and by providing relevant databases directly to rural America. Federal and State extension services and the Federal Depository Library Program are obvious candidates. Many government agencies already develop databases on research status and results, economic and demographic statistics, trade opportunities, and the like. The key is to find ways to make these databases available to rural libraries and hence to the rural entrepreneurs and activists. Ultimately, if rural America is fully wired (or cabled or dished) for digital data transmission and switching, rural citizens will be able to access remote online databases directly from their homes and offices, and download to compact disks or other storage media, just as many urban and suburban citizens are already doing.

[83] For example, small information technology consulting companies are beginning to locate in rural areas. At present, these companies still do most of their business in metropolitan areas, but they are ready and able to serve rural needs as the rural market develops. Also, in some rural regions, the small high-tech companies are banding together in consortia to share ideas, information, market tips and the like. These high-tech consortia offer great potential to bring together research, educational, entrepreneurial, and economic development interests focused on rural America.

[84] The Star Schools legislation specifies two formats for the composition of eligible partnerships. In one, membership must include at least one State educational agency, State higher education agency, or local education authority responsible for a significant number of poor or underserved students. Furthermore, this type of partnership is required to have at least two other institutions from a host of types, including universities, teacher training institutions, and public broadcasting entities. The other type of partnership must include a public agency or corporation already formed to operate or develop telecommunication networks to serve schools, teach training centers, or other education providers. All partnerships must be statewide or multistate. These requirements were meant to create new paths to improve the educational system by fostering cooperation among institutions. For further discussion, see U.S. Congress, Office of Technology Assessment, *Linking for Learning: A New Course for Education* OTA-SET-430 (Washington, DC: US Government Printing Office, November 1989), pp. 136-141.

Developing a grant program of this kind has a number of appeals. If effective, it would have a very high pay off. Moreover, it can lead to self-sustaining arrangements, if it generates cooperation and a group commitment among different players. The Federal Government could also maintain a good deal of program control, because grants would be provided on a competitive basis. Just as the Federal Star School Program stipulates the range of players that need to be involved in developing educational partnerships, and the amount of benefits to be targeted for low-income groups, so too a rural grant program could require that certain criteria be met. It assures cooperation and a holistic development perspective by requiring that a broad range of participants be involved in devising and implementing the development grant proposal.[86] And it could provide for equity and diversity, by setting aside a given proportion of funds for different kinds of rural communities. In addition, it could foster a statewide commitment by requiring a matching grant.

There are some problems with this approach. Many programs and partnerships developed under such a grant or loan program could prove threatening to rural communication providers and give rise to a number of tricky regulatory problems. There are also bound to be some failures with such an unconventional approach. The cost of failures can be reduced to the extent that something can be learned from them, and the experience gained can be built into subsequent grants. Moreover, the rate of failure is likely to be less if this kind of program is implemented in conjunction with the informational technology transfer approaches identified above. Some regulatory problems might also be avoided if plans are discussed regularly with State regulators. Conflicts with local communication providers will be minimized, if they are participants in the development of any grant proposals, and thus also have something to gain by their acceptance.

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[85] The Department also supports nine regional educational laboratories, with 25 percent of each lab's resources targeted specifically to rural education (at congressional direction, $14M total for FY87-90). Information technology is a strong theme running throughout many rural projects, and also in math and science education projects directed at metropolitan as well as rural areas. The rural projects cover virtually every conceivable technology application for curriculum development, classroom teaching, and school management. Technologies include microcomputers, distance learning (via satellite, broadcast, and terrestrial transmission), computer conferencing, electronic bulletin boards, videodisks, and compact optical disks. In addition, the rural projects include development and delivery of innovative courses on career preparation and planning for rural students, ranging from building business entrepreneurial skills through hands-on "enterprise" experiences, to learning how changes in the global economy and technology effect job prospects, to identifying viable career paths for those who wish to continue to live in rural areas (or return to rural America after college or military service). See U.S. Department of Education, Office of Educational Research and Improvement, "Thirty-One Rural Education Projects of Nine Regional Laboratories," no date, and *Regional Educational Laboratory Request for Proposal*, RFP-91-002, April 1990.

[86] Information technology investments in rural schools pay off several times over because many schools serve multiple purposes in the community. Distance learning and computer information systems used by students during the day may be used for adult education and business development seminars in the evening. Rural citizens generally view the K-12 school system as one of the best hopes for the future of their children and community.

Appendix, Glossary, and List of Contributors

Appendix
Field Journal

Background

One cannot undertake a study of rural development without attempting to understand the people, their cultures, their environments, their problems, and their hopes and aspirations. Americans pride themselves on their individuality, and the differences among the people of a State or a region are often as great as between the States themselves. There are common values shared by many, but the ways that these values enter social and political discourse are often very different among communities. An outsider can only hope to sample this diversity; to understand it, one must live it.

The project staff chose four States to visit in the course of the study: Kentucky, New Mexico, Washington, and Maine. These States were selected for geographic balance, ethnic and economic diversity, and contrasting approaches to the development of the telecommunications infrastructure.

Kentucky is a Midsouth State that relies heavily on the infusion of foreign investment for economic development. Its educational system is undergoing substantial changes, and State leadership is placing major emphasis on telecommunications to bolster education. Parts of the State face an economic and social crisis; other areas prosper with the assistance of Japanese automobile and electronic manufacturing.

New Mexico is a Southwestern State with a significant Hispanic and Native American population. Its economy is based largely on natural resources, and the Federal Government plays a major role in the economy through the operation of military and Federal research laboratories. Much of the undeveloped land is owned by the Federal Government. The populace largely lives apart from one another in enclaves of their own, with only nominal contact among the various cultural groups.

Washington is a Northwestern State that shares a common border with Canada—America's largest trading partner—and is a gateway for exports to the Pacific Rim. High-technology aerospace, nuclear, and computer-related firms contribute significantly to the economy of western sections of the State. Agriculture, forestry, and grazing are staple economies for the eastern section. Urban areas of Washington are developing so rapidly that decentralization of business to rural areas has become a development strategy.

Maine also borders on Canada, but has only one narrow common border with another State (New Hampshire). It is the most sparsely populated New England State. Natural resources, particularly timber and fisheries, play an important part in Maine's economy. The Federal Government also contributes through military bases and defense industries. Maine is placing great reliance on telecommunications to deliver educational services to small communities and scattered institutions. Perhaps more than any other State, Maine is depending on telecommunications for its social and economic future.

During the course of the visits to these States, OTA staff met with economic development professionals, telephone company representatives, politicians and activists, educators and academics, business people, and "ordinary" citizens in a number of communities.

The sections that follow are narrative impressions of what OTA staff experienced in their visits to the four States, and are not analytical. Each successive section, Kentucky through Maine, builds on the impressions and understanding gained in the previous States. Thus, this journal is the sequential log of the experience gained by OTA staff as they encountered the views of those with the most at stake in revitalizing rural America.

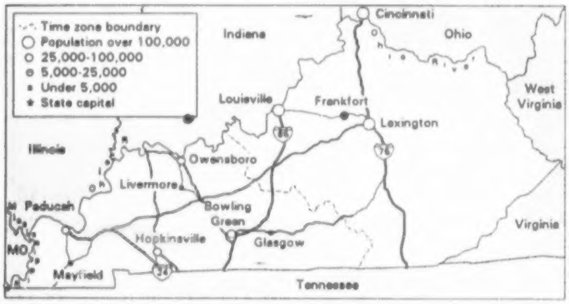
Kentucky

The Commonwealth of Kentucky's economic base, like many other rural States and communities, is in transition as agriculture production is consolidated and the coal mining and tobacco industries are crippled by mounting national health and environmental concerns. In addition to representing the rural Midsouth, Kentucky reflects aspects of Appalachia, the Ohio Valley, and the Midwest. Furthermore, Kentucky is an example of a State with a history of unionization and with an economic base that does not require high education levels.

We contacted a broad base of people to get a cross section of opinions and perspectives—educators, elected and appointed officials, businesspeople, telephone executives, regulators—across the State. Covering approximately 600 miles in 6 days, we spoke with more than 60 people in Paducah, Mayfield, Hopkinsville, Owensboro, Livermore, Bowling Green, Glasgow, Lexington, Frankfort, and Louisville. However, we were unable to visit some of the most depressed and isolated areas of Appalachia in eastern Kentucky (see figure 1).

A State of Crisis—From our discussion with a gathering at the Purchase Area Development District, rural America—not just western Kentucky—was characterized as being desperate and in a state of crisis. "Do we want rural America?" Charles Terrett, the Superintendent of the Fulton County School District, asked, "or do we want urban America with a wasteland in between?" Fulton County Judge James Everett called measures to salvage

Figure 1—Map of OTA's Field Study in Kentucky



SOURCE: Office of Technology Assessment, 1991.

rural America "a matter of survival." Rudy Weissinger provocatively declared that rural America no longer exists at all.

Not everyone was as alarmist. The neighboring area development district boasted of 3½- to 4-percent unemployment; others were encouraged by the prospects of new industries locating in the State, assisted by the State and programs such as Certified Cities. A growing mutual interest between Kentucky and Japan—such as the State floating bonds on the Japanese market and the attraction of Japanese electronic and automotive firms—bodes well for future development. And a humbly encouraging milestone for Ohio County—a McDonald's franchise recently opened in Beaver Dam.

The Importance of Education for the State's Development—The dominant theme throughout the Commonwealth was the importance of education (socially and economically) for the State's future. The State's Supreme Court recently declared the public secondary school system unconstitutional, and most of those we talked with regard this decision as positive, if embarrassing, and a step in the right direction.[1] The decision seems to punctuate a groundswell among the Commonwealth's citizenry that an aggressive and innovative strategy for improving the State's education is critical to Kentucky's future. This commitment to education is evident throughout. Examples of this include Kentucky Education Television's facility to deliver science and foreign language programs via satellite to secondary schools, and tele-education programs for community colleges fed from university courses.

The focus on education is based on the assumption that by providing better education, Kentucky can draw well-paying skilled jobs and foster social and cultural amenities, such as fine arts and health services, that will help attract new companies.

Others are more cautious. We were told that the Supreme Court ruling presents a potential problem for higher education, because funds that must be directed to redress the public school crisis will siphon funds from colleges and universities. The community colleges in particular stand in peril. Despite soaring enrollment, community colleges receive only 64 percent of the funds they need to operate optimally, according to a formula established by the Council on Higher Education. This limitation strains faculty and staff.[2] Kentucky ranks among the bottom third States in Federal monies for higher education, a circumstance possibly related to the fact that it is one of the few States that does not have a Federal research center.

It was said by some that the clamor for education is a smokescreen, that the improvement of general education endangers one of Kentucky's major assets, a benign and pliable workforce. One of Kentucky's salient attractions for companies like Toyota is its proximity to Detroit, and its eager nonunion workers outside the coal regions.

The Marriage of Communications Technology With Education—Educators in particular see telecommunications as an important tool to broadening and strengthening curricula. Almost to a person, education is seen as a key factor in any strategy for developing the State's economic position. Telecommunications is an integral part of these plans, insofar as satellites, fiber optics, and microwave facilities can deliver distance-learning programs to schools that lack the resources to draw able teachers and offer diverse, well-grounded curricula.

The best example of distance-learning in the State is Kentucky Educational Television's (KET) notable, highly visible, and well-funded operation that broadcasts courses inside and outside the State. If KET's service does not suit a community's needs, the land-grant colleges and the regional universities offer similar tele-education programs through one-way video and two-way telephone lines. For example, Murray State delivers third- and fourth-year courses over two-way interactive video to students at Paducah Community College.

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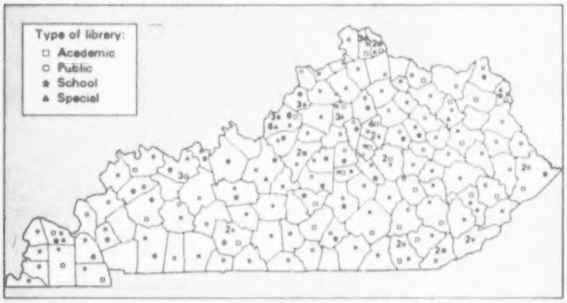
[1] Since the visit, the State legislature, to which the court explicitly attached the blame for the failure to provide equitable and affordable public education to all the State's citizens, has acted vigorously to address this problem. It passed a substantial tax increase—$1.3 billion over 2 years—in order to entirely revamp the organization and administration of the public schools. In effect, greater efficiency and responsiveness will be accomplished by instating a Commissioner of Education (in place of the Superintendent for Public Instruction) and streamlining the Department of Education. The Education Reform Act stipulates that the State Board for Elementary and Secondary Education (to be created) will establish performance standards for both schools and students, as well as a system of rewards to foster compliance. Principles and local schools districts will nevertheless be afforded considerable autonomy in determining how they will meet those standards.

[2] The State legislature, in the Education Reform Act of 1990, has allocated additional funds for higher education as well so that the community colleges will operate with at least 80 percent of the funds that the Council on Higher Education estimates are needed.

Figure 2—The Kentucky Library Network



SOURCE: The Kentucky Library Network, March 1990.

Distance learning is, in some instances, becoming a big business. Large public and private grants are at stake for distance learning, as politicians ply a can't-miss campaign for better education. Despite a promising start—such as KET's network—distance learning is still relatively untested and may raise some treacherous political and social issues, particularly with regard to the origination and control of programming.

New technologies, particularly telecommunications, have tremendous potential for contributing to education through libraries. Western Kentucky University has a facsimile network throughout its service area to expedite the search and retrieval of materials, and the Lexington Public Library is involved in a similar project (LEXNET) to tap the resources of the University of Kentucky's libraries (see figure 2). The Kentucky Library Network, for example (with some 200 participating library branches), plans to create an electronic card catalogue. Finally, new technologies offer opportunities for libraries to expand and streamline their resources through, for example, CD/ROM and access to online information databases.

Better Jobs—Kentucky currently enjoys relatively high employment, so the goal of development now concentrates on bringing in better jobs. Signs of Kentucky's overall economic growth or recovery are evident everywhere, and one of the most significant indicators is the drop in the State's unemployment rate, which, at 5.0 percent in July 1990, was below the national average. Many of the new jobs are low-wage service industry jobs, so the challenge now is to improve the quality and the salaries of jobs.

Internecine Rivalry—On its State road map, Kentucky proclaims itself "The Uncommon Wealth." Presumably, this provocative pun refers to the State's uniquely contrasting topography and to the large number of counties, both of which contribute to the State's uncommon political factionalism. There is open rivalry and a sense of territorialism among universities and the land-grant colleges, each believing in its own superiority for best serving the community. There is friction between KET and higher education institutions over the effectiveness of their distance-learning programs. Similarly, the delicate issue of bypass sparked a discernible (and understandable) tension between the two major telecommunications players, South Central Bell and the Kentucky Emergency Warning System (KEWS). Finally, there is surprising lack of communication among the various A Development Districts with regard to mutual strategies for development and resource sharing. As a consequence, the factionalism of the State seems to draw attention and energy away from a concerted statewide development strategy and instead to focus on picayune turf battles.

Photo credit: Mark G. Young

Overlooking Bowling Green, KY

There are, however, notable exceptions to this general observation. In order to avoid (or at least blunt the effects of) another severe recession, a group of citizens from the Purchase area in western Kentucky enthusiastically embraces the potential for new technologies (particularly telecommunications) to strengthen their economy by improving education and job training, by providing new jobs, and by making existing services more efficient. On the premise that rural communities must involve themselves globally in order to survive, they stress that "regional partnerships" between private enterprises and government are critical if rural communities are to afford advanced technology since the marketplace tends to discriminate against small customers.

Duplication of Services and Infrastructure—Kentucky has virtually two communications networks: the public communications network of the phone companies and the Kentucky Emergency Warning System (KEWS), a State agency that handles official State communications, such as for police dispatches, and which ensures a back up to the public network in emergencies.

The Involvement of Japan—The foundation of the State's development strategy is to court new foreign industry and investment—primarily the Japanese. The location of automobile manufacturing and electronics plants, such as Toyota in Georgetown and Sumitomo in Morgantown, are triumphs for the towns and counties as well as the State. Kentucky was the first State to issue bonds on the Japanese bond market—further evidence of the Japanese mystique.

Technical and Technological Assistance and Standards—Many of the people we talked with were informed about and comfortable with modern technology, but this level of knowledge was likely and apparently not representative. Jack Eversole, Executive Director of the Barren River Area Development District, quipped, "we don't know enough to be ignorant." The need for technical assistance to overcome the general fear or distrust of technology was identified as an important factor for modernization. Development involving modern technology runs the risk that rural folks, less familiar with technology, might be induced to invest in equipment that would soon be obsolete. In some instances, a system exists, but the expertise to use it does not. Jenny Boyarski, Librarian at Paducah Community College, noted that "technology has brought the world to the people, but we do not have the people to take it out."

Apprehension That Development Implies Urbanization—The notion of "development" is very tricky because it is not obtained without a price. Communities know that development is the only alternative when the status quo means doom, but most are cautious and want to control development to avoid the negative effects that accompany urbanization of rural areas. Chief among the fears is the urban blights that might afflict rural communities—principally pollution, higher incidence of crime, divorce, juvenile delinquency, and teenage pregnancy. Ways must be found so that participation in the modern age can be achieved while preserving rural values and a rural lifestyle.

Telecommunications Less as a Business Tool—Kentucky's Certified Cities program enables communities to measure and publicize their capacity to host new industry. The program has added telecommunications to its criteria, but the large industries that Kentucky targets are not typically the information-intensive firms; and those firms that do require advanced communications services often install their own networks. The service industry jobs that are expanding are not the high-technology or high-skill positions that need data services.

The mission of Kentucky's Rural Economic Development Authority is to assist the "commonwealth's depressed counties" in attracting and accommodating new manufacturing projects. The current administration has identified telecommunications as a valuable resource for strengthening and diversifying the economy. The Authority commissioned a study on the potential and procedure for attracting information-based industries to the State. The Economic Development Cabinet, in conjunction with South Central Bell, has moved to incorporate telecommunications-related industries in State development strategies.

Photo credit: Mark G. Young

Near Mayfield, KY

Triage—The issue of a strategy of triage for developing rural America—where money and resources are targeted to those communities able to survive and prosper—is sensitive because it runs counter to the sense of social welfare and justice. Although politically dangerous, triage is a pragmatic strategy for dealing with rural regions and communities that are in economic decline.

The profile of the community that can benefit from telecommunications is taking shape. Ironically, those communities most in need of innovative development strategies are least able to assess the role of telecommunications in economic activity because other essential services take precedence. Healthy communities that could strengthen their positions through advanced communications systems and services are usually least interested in anything that might upset their successful balance. The communities in the middle—those with the opportunity and the incentive for dealing with the impending crisis—are the ones that cherish what telecommunications and new technologies may bring.

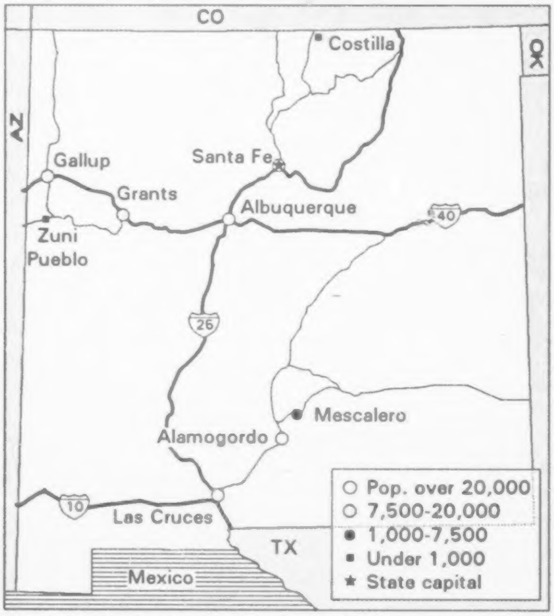
New Mexico

New Mexico, with its cultural heterogeneity, its substantial nonmetropolitan population, and low standings in most economic indicators is representative of the Southwestern United States. Fifty-one percent of the population lives in nonmetropolitan areas (as compared to the national average of 23 percent), Hispanics account for 33 percent of the State's citizenry and Native Americans for 7 percent. Its vast tracts of sparsely populated territory are typical of the Southwest. Much of it is ruggedly

Photo credit: Mark G. Young

Zuni Indian Reservation, NM

Figure 3—Map of OTA's Field Study in New Mexico



SOURCE: Office of Technology Assessment, 1991.

mountainous or arid, which creates difficult obstacles to development and spawns a new set of communications priorities. New Mexico's topography also creates unique opportunities for development.

We allotted 8 days to cover New Mexico, much of which we spent in Albuquerque and Santa Fe meeting with government officials and representatives from the University of New Mexico and the telephone and utility companies. We visited a modest effort at indigenous economic development in Costilla, a stone's throw beneath the Colorado border. From Costilla, we went to Grants to see how a community faced with the decline in the mining industry handles economic development, to the Zuni Indian Reservation, and then to Gallup. We then flew to Alamogordo, to learn about the State's southern half as told in Mescalero and Las Cruces (see figure 3).

Traditional Society—New Mexico's eternal problem is water. In a region where irrigation is at a premium, the control of water and where it goes determines power and wealth. Such a political order begs the question of the potential for development (economic and social) because of the entrenched and unidimensional hierarchy. For example, on the basis of our experience in New Mexico, it is clear that the State retains a patriarchal social and political order. The movement of women into business, academia, and politics is a relatively recent phenomenon, therefore women may be less prone to protect the status quo and more likely to welcome development. Our experiences in New Mexico and Kentucky appear to bear this out.

The history of New Mexico began long before its statehood in 1912. Originally inhabited by Hispanic ranchers and Indians, these deep-rooted, land-based peoples are profoundly distrustful of outsiders and culturally predisposed against wholesale economic development. Earlier exploitation of Native Americans in the name of progress has made development anathema to many Indian Nations. They fear that improvements in infrastructure will destroy traditional tribal communities. "Economic development—for whom?" they ask.

For tribal peoples, the conventions of money and time are of less significance than in general society. The Zuni Indians, for example, leave the marketing of their jewelry—and a healthy portion of the profits—to outsiders, even on their pueblo. We were told repeatedly that they have a different sense of—even disregard for—time.

Not all tribes, however, are averse to entrepreneurship and development. The Mescalero Apaches sit on spectacular land and are harnessing this resource for tourism. One leader of the Mescalero Apache tribe is purported to have said: "the Zunis make jewelry, the Navajos make blankets, the Apaches make money."

Cultural Heterogeneity—The State is comprised predominantly of three major cultures. New Mexico's diverse cultural base, with its profound distrust of outsiders and the rivalries and misunderstandings among them, hinders economic development. The Anglos, Hispanics, and Indians are settled in closed, autonomous communities with little movement among them. For example, the effect on education of the research facilities of Sandia or Los Alamos National Laboratories does not reach far beyond the enclaves themselves. Even among the Native Americans, we were told, there is little cooperation. While the All Indian Pueblo Council serves as a political organization for the 19 pueblos, each tribe retains and cultivates its autonomy on its own land.

Education and Development—In contrast to Kentucky, where education and economic development and telecommunications and quality of life are tightly interwoven, the importance of education in New Mexico for overall quality of life—if not for economic development—is less obvious in development policy. As a strategy for economic development, Kentucky, for example, embraces a redoubled dedication to strengthening education as a means to attract or nurture high-technology, information-intensive industry by both providing an expert workforce and an environment to satisfy it.

Despite one of the highest per-capita concentrations of Ph.D.s in the country as a result of defense research facilities, there is apparently little transfer of technology to the State at large. There is no emphasis on higher education needed to match high-technology jobs. (Cultural separation affects this, since the stress on education centered in the research enclaves has not permeated the other communities.) We heard repeated boasts that New Mexico's labor force was highly skilled and highly motivated. However, the industries that New Mexico attracts require less skilled labor than those in Kentucky.

Infrastructure—In New Mexico, the potential for economic development is shaped largely by the State's topographic and demographic characteristics. Because much of the State is ruggedly arid and mountainous, the population and infrastructure, including a modern telecommunications system of fiber optics and digital switching, is concentrated along the fertile Rio Grande valley. While this imbalance promotes development along the river, it creates problems for the flanks of the State, which are less accessible for telecommunications, roads, water, and electricity. US West has a program to defray the expense of installing telephones to remote rural communities, but even so the small scale and rugged topography slow modernization. Many of the independent telephone companies have modern equipment that equals or surpasses US West's digital and fiber network.

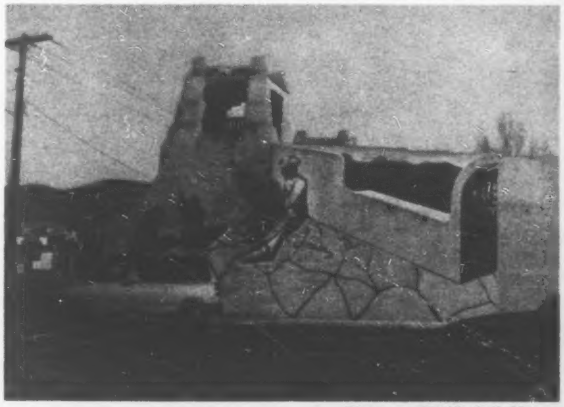


Photo credit: Mark G. Young

Mural in Taos, NM

Access to Capital—Telecommunications is not a major barrier to development, but access to capital and markets is. State Representative Nick Salazar pointed out that the lending history of agencies such as the Small Business Administration discourage bankers from funding telecommunications projects.

Politics as a Key Economic Bottleneck—Local communities depend heavily on political patronage and connections for industry or government contracts. Politics is a major factor in economic development in New Mexico. One development official noted: "Instead of governing, government provides jobs; instead of educating, education provides jobs."

The development strategy for Grants, for example, once a prosperous uranium mining town, includes locating a branch of the State's highway department and bids for a large Federal penitentiary (the third such facility and second public one),[3] a new State armory, and a new convention center. Carlsbad, as well, was bidding for a hazardous waste disposal contract. Meanwhile, the northern town of Costilla had a hard time locating funding because, as one of its leaders said, it lacked a political connection.

State Awareness of Telecommunications—The State is aware of the potential for telecommunications to improve economic development. The New Mexico Economic Development and Tourism Department names investment in the public infrastructure as one of four strategies for economic development: "Telecommunicationsshould be considered a crucial infrastructure capability that can serve economic development and deliver educational and other public services.'' It has inaugurated a program called One-Stop Shop whereby small businesses throughout New Mexico can access an online database with information about the State and its communities, such as maps, tax rates, licenses, and regulations. It is too early to know who the main users of this service will be: whether the small local firms will become aware how (and if) One-Stop Shop may strengthen and expand their businesses, or whether it will be a tool for industrial recruitment. TechNet, a telecommunications network that the State created in the early 1980s to link the State's major universities and Sandia Labs, receives mixed reviews.

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[3] According to an article in *Business Week* that describes the allure for New Mexico's rural areas for the location of prisons, "Much of New Mexico's vast desert is unzoned, so prison entrepreneurs consider the state a prime location. Three other correctional companies have been scouting rural sites there." A facility that Corrections Corp. of America plans to build in Estancia, NM, "will employ 80, with an annual payroll of $1 million." *Business Week*, "As Prisons Go Private, The Neighbors Go To Court," June 11, 1990, p. 28.

Problem of Leakage—If technology benefits those who know how to use it, what happens to those who do not? Is it a neutral or negative factor? Or does the fallout of technology apply beneficially to everyone? Insofar as improved communications can help locate new capital and new markets, it has potential for small communities and small businesses. However, communications technologies can also have negative effects due to financial and cultural ''leakage'' as outsiders capitalize on these technologies. The small entrepreneur in search of financing is likely to be less able to use telecommunications to find capital than the banker is able to use it to find better markets outside the State to invest capital.

New communication technologies may breakdown the autonomy of the indigenous cultures. Children with access to better educational resources through distance-learning techniques may be induced to leave home to complete their education, thus removing them from their cultural heritage.

There are instances where technology may preserve rather than erode culture. The Zuni Middle School, with the support of Apple Computers, is creating a program to put its language on hypercard. While most of the Zunis are familiar with the spoken language, it is rare that they know it in written form.

Industrial Insularity—An interesting hypothesis heard in New Mexico was that, unlike most other States, it is buffered from national economic decline related to manufacturing because by the time it was admitted as the 47th State in 1912, the industrialization of America had long been under way and had largely passed by New Mexico. It is thought that because the State's traditional land-based cultures were largely undisturbed by industrialization, it is less likely to follow current national trends, such as the crisis faced by many rural communities as manufacturing moves overseas and farms are consolidated.

The Relation Between Poverty and Development—If it is true that poverty is a state of mind as much as an economic and material condition, then one must ask, ''poverty by whose definition?'' As Ted Jojola of the University of New Mexico pointed out, the common statistical indices that categorize people as impoverished are immaterial to those with different values and priorities. The Acoma Indian Tribe turned down a lucrative movie opportunity that interfered with sacred religious rituals. The Tribe's attitude toward development shows the priorities of people who choose to live in rural areas by design and not default.

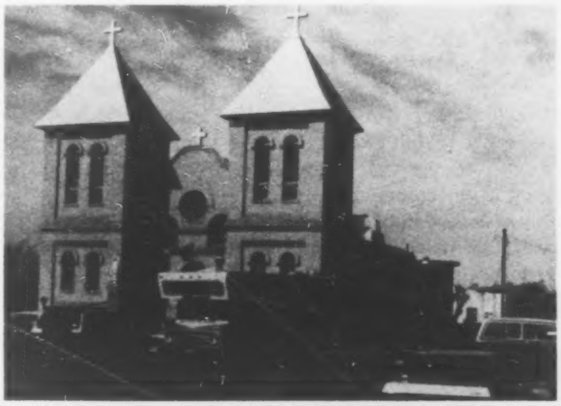


Photo credit: Mark G. Young

Historic neighborhood in Las Cruces, NM

Reinforcing what we learned from Kentucky, our experience in New Mexico suggests that those most able to undertake economic development and use telecommunications and modern technology are those neither the worst nor the best off. For the depressed communities, the basic need for electricity, water, and food takes precedence over planning for the future. These troubled areas typically are troubled because of a marketable natural resource or, as is often the case in the rural Southwest, for lack of water. The infusion of new communications technology can only accomplish so much in the face of such obstacles.

Who Else If Not the Phone Company?—There is a consensus among the people we visited in New Mexico that restrictions on telephone companies from manufacturing equipment, providing information services, and from delivery of broadcast video are stifling to rural communities. Rural areas strain as they are unable to generate economies of scale to warrant a broad range of efficient and modern services. The vertical integration of the utilities is considered the best chance for obtaining adequate service.

The prosperity of utility companies is tied to the prosperity of the areas they serve. It is clearly in their interest to develop markets where they do not exist and strengthen ones that do. Therefore, a major initiative for development in New Mexico is coming from US West and Plains Electric. Plains Electric, for example, is delivering satellite television to rural areas of the State not served by a cable system to slow the trend of families moving from farms. Plains plans to hire an economic development coordinator to supplement the State's agency, which, according to Plains, lacks adequate personnel and money to recruit industry. US West, meanwhile, provides $2 million per year to defray the costs of connection to remote customers as a result of a 1987 bargain with the New Mexico Public Utility Commission. In addition, US West is involved in hearings regarding a $20 million fiber optic education network linking the 2- and 4-year colleges to be built beginning as early as 1991.

Public Utility Commission Policy—Economic development is not a part of the statutory duty of the State regulatory commissions, but regulatory and pricing policy directly impacts rural telecommunications infrastructure and the possibilities for development. Universal service is intended largely to benefit remote rural citizens, therefore, it is a priority of the New Mexico Public Utility Commission (PUC) to bargain with US West to leverage the extension of telecommunications services to rural communities for more generous pricing schedules in metropolitan areas. The New Mexico PUC is elected, not appointed, and therefore is directly accountable to the populace, so the cost of telephone service is a primary issue for its constituents.

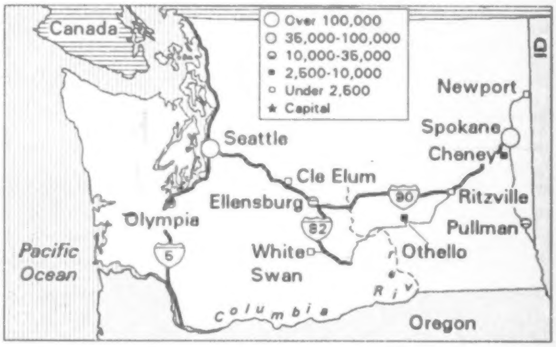
But, the current definition of universal service may not be adequate for rural citizens to have comparable access to information technologies as urban customers, especially as deregulation and competition has introduced rapid modernization.

Postal Service: Early Communication Technology—While we presume the current and foreseeable state of telecommunications (fiber optics, digital switching, integrated broadband networks) we were surprised (and humbled) to find that some rural areas lack even the most basic communication technology—postal service. Many of the areas without an addressing system are barely inhabitable and undevelopable, while some communities may choose to preserve their rustic character. The expense of an addressing system for outlying areas is a major impediment to development.

Washington

The level of thinking in Washington at the State and local levels about the use of information technologies for rural economic development is well advanced. The tension between rural and urban, characteristic of many States, is acute in Washington, where this dichotomy poses significant problems for State policymakers. The educational level is a barometer of the citizenry's ability to make use of technology for development. Washington's high standard of education contrasts with other States where education has not been a priority. Washington's economy, which depends substantially on exports, is flourishing despite the decline of natural-resource-based activities that contribute significantly to the State's economy.

Figure 4—Map of OTA's Field Study in Washington



SOURCE: Office of Technology Assessment, 1991.

A conscious effort was made to heed the perspectives and concerns of the "ordinary" citizen in Washington, a strategy that flushed out previously muted issues. Using Spokane as a hub for the first 2 days, we traveled south to Pullman and Washington State University and north to Newport. We stopped in Othello for one planned and several impromptu conversations on the way to White Swan, where we convened a meeting with interested officials and citizens from around the lower Yakima Valley. We then traveled to Olympia to learn the issues and objectives of the various players at the State level, and finally to Seattle (see figure 4).

Prosperity—Over the past 5 years Washington State has enjoyed a robust economy, with opportunities for economic development. Washington as a whole benefits from a diverse and balanced economic base, including forestry and agriculture, as well as high-technology industries, such as aerospace and software development. The State is fast gaining a reputation as an eminent wine-producing region, and vineyards are conspicuous along the Columbia River. A very scenic State whose landscape features the Cascade and Olympic Mountains and the Pacific coast, Washington also features one of the few deep-water ports on the west coast. As trade with Japan and the countries of the Pacific Rim increases, Seattle and the area surrounding Puget Sound are booming. The State is also benefiting from the free trade pact with Canada. The abundance of rainfall for much of the State and the system of dams to provide energy and irrigation for the central plains makes this arid area fruitful. Other parts of the West have suffered from droughts for several years, but Washington's agriculture has thrived.

Nevertheless, there are pockets that do not equally share in the prosperity, particularly the rural and remote areas whose economies are heavily or entirely based on natural resources. The natural-resource-based industries are on the whole in decline or stagnant. Washington's apple industry, for which the State is famous, has been unsettled in recent years by overproduction and the use of the pesticide Alar. In Pend Oreille County, the northeastern most county with borders on Idaho and Canada, agriculture, once significant in the region, is now reduced to hobby farming; in the meantime, the dominant timber industry likewise declines.

Many agricultural- or timber-dependent communities are seeking new ways to support their local economies. Tourism and retirement, both taking advantage of rural Washington's quality of life, are major elements in an effort to attract diverse, small, balanced, and usually "clean" enterprises. The town of Leavenworth in central Washington is a successful model of tourist-based development patterned after a Bavarian village. The Department of Community Development, meanwhile, is working with the town of Forks on the Olympic peninsula to help it recover from a collapsing economy based on timber. Plans for retirement communities, which help stabilize the economy through steady income, are often hampered by inadequate health care in rural areas.

Development Philosophy—Policymakers in Washington have developed a mature economic development philosophy. In contrast to New Mexico where opportunities are few by comparison, or to Kentucky where recessions follow booms in fast succession, the prosperity has permitted policymakers "the time to intellectualize," in the words of the Director of the Department of Economic Development. They have taken a holistic approach to development, in which the recruitment of industries is part of a broader agenda that aims to create conditions to support and nurture a diverse, balanced, and strong economic base. Washington is able to attract "clean" high-technology industries such as software design and biotechnology.

Rural Development as Seattle's "Growth Management"—Ironically, the problem facing Washington policymakers is not so much the need for economic development, but rather the need for "growth management." Recently, Seattle has been recognized for its treasures without the problems usually found in big cities. However, Seattle is developing its own problems as a consequence of rapid growth—strains on highways and housing for example—thus "growth management" is a high priority. The need to control growth has triggered an appreciation of how the State's rural areas can share in the State's prosperity and contribute to its expansion. Rural economic development is an important part of a "growth management" strategy for spreading Seattle's prosperity throughout the State.

Photo credit: Mark G. Young

Irrigating fields in White Swan, WA

Governor Booth Gardner created a Growth Strategy Commission to investigate "economic diversification" and ways to balance growth in the State, while the legislature commissioned a report on the potential for urban companies to relocate parts of their operations to rural areas. Telecommunications is seen as a vital resource that would enable distant and small communities to share in the prosperity.

The studies concluded that telecommunications was a necessary part, but not sufficient on its own to foster economic growth in Washington's outback. This conclusion is reached in other reports, such as "Telecommunications and Rural Development" by the Partnership for Rural Improvement of the Community College of Spokane, which notes that while communications per se will not guarantee development, the absence of adequate communications reduces the possibilities for development. Small cities rather than remote or small villages most likely benefit from the relocation of businesses from urban to rural areas with the help of telecommunications.

Washington's rural easterners cautioned that because this recent awareness of urban-rural linkages is caused by the overgrowth of Seattle, those promoting these linkages may not be sensitive to the needs and desires for development in eastern Washington. Many of Washington's citizens east of the Cascade Mountains feel more allied with the citizens of northern Idaho and western Montana, than of western Washington. In some areas, such as Okanogan County in north-central Washington, economic development in most any form is welcome. Others, such as some residents of White Swan, a small village on the Yakima Indian Reservation in the lower Yakima Valley, favor slow and controlled growth. Some want no growth at all.

The State's interest in rural development to solve Seattle's growth problems does not always appeal to local economic development professionals. The relocation of a large firm (more than 50 employees) can threaten to dominate an area and upset its balance. These local development "guerrillas"—as one describes herself and her colleagues—are more sensitive to the needs and desires of the community.

Sense of Community—Despite the east-west and rural-urban schisms, there is a remarkable degree of community throughout Washington and a sense that, despite some exceptions, the State functions as a unit: this contrasts to the insularity of New Mexico and the factionalism of Kentucky. The common phrase "forging sectoral linkages" reflects the notion that the State's economy is the sum of its parts: that the fortune of Seattle depends on and contributes to the fortune of Spokane, which depends on and contributes to the fortune of the nearby communities and towns. The word "networking" was often mentioned to describe the key to a community's success, and one citizen noted that "everybody is facing the same problems, so everybody has to work together." Frequent and casual reference to the transformation of Eastern Europe showed an awareness and sophistication that indicated that their own communities must participate in the larger, global community.

Environment—Economic development in rural Washington involves delicate environmental issues. Washington State has a large and active environmental community. Recently, the tension between the environment and jobs has been fought over the issue of the protection of the State's ancient forests—the habitat of the spotted owl. Efforts to halt or interfere with logging threaten the communities that depend on the timber industry. Those primarily concerned with development see the spotted owl as a symbol of how the concern for a bird is taking precedence over people's lives and livelihoods. In reaction to the tumultuous times for the timber industry, the Park Service has emerged as a new player in development by more actively promoting tourism in park facilities.

Financing Development—The difficulty of securing capital, as elsewhere, is cited as a significant impediment to development. Because the banks serving rural areas typically are branch facilities of large banks, their interest in and knowledge of small rural businesses is limited. Small entrepreneurs in Washington face another financial burden. By State law, public credit cannot be extended for private use. Finally, communities that border Idaho must compete for businesses against a more generous tax structure across the border.

Regulatory Policy—While development advocates believe in the "Field of Dreams" credo—"if you build it, they will come"—the State Utilities and Transportation Commission (UTC) which regulates telecommunications, operates under the maxim: "if you build it, somebody has to pay for it." UTC, with its obligation to ensure that each customer has an appropriate level of service at a fair cost, is cautious not to encourage (let alone mandate) the deployment of technologies or services whose applications have not been demonstrated. But market-orientation may tend to shortchange rural areas. The experience in Europe, according to Bill Beyers, Professor of Geography at the University of Washington, is that technology deployment and development premised on market forces tends to work against rural areas.

Photo credit: Mark G. Young

Cle Elum, WA

The general consensus throughout the State seems to be that the existing communications infrastructure is sufficiently sophisticated to handle most foreseeable applications. Nevertheless, there are complaints about "dirty lines" degrading service and interfering with data transfer. UTC has the goal of single-party, touch-tone service to a high proportion of multi-party lines in both rural and urban areas by the end of 1992. A major issue for rural telephony is the cost of service, especially when calls to the local school or to a neighbor a few miles away often involve a toll charge, and when the rate for basic service is $30 or $40 per month. Extended area service (EAS) is a mechanism to redraw exchange boundaries to match the patterns of regional commerce and reduce the cost for rural communities to communicate with the town or city on which it depends. However, the savings accrued to rural customers and businesses is largely taken at the expense of the small independent telephone companies whose settlements from the pool of long-distance tolls is reduced at the same time the traffic on their networks increases.

Education and Development—Like Kentucky, Washington State is unequivocally committed to education for future progress, and here too telecommunications serves an important function in strengthening educational opportunities. The Satellite Telecommunications Educational Programming (STEP) network, for example, adminis-

Photo credit: Mark G. Young

University of Idaho, in Moscow

tered by Educational Service District 101 in Spokane, provides programs taught by educators specially trained for broadcasting to schools, both rural and urban, in 12 States. With the unique visual capabilities of television, STEP is able to present course material in innovative ways. A class in Japanese, for example, may be presented with a Japanese music video to help students understand the culture and its idiom. Although its curriculum is limited to six classes geared to college preparatory students—calculus, Japanese I and II, advanced English, and Spanish I and II—it also delivers inservice programming for teachers. Washington State University in Pullman provides courses to branch campuses through its WHETS facility, which links them by a two-way audio and video microwave system.

Although STEP targets rural schools with limited facilities and teachers there are barriers to the delivery of education to small and remote rural communities and school districts, because of the expense of installing and subscribing to the programming.

Demand for Information and Technology—The need to effectively and efficiently communicate with distant and foreign markets is important because much of the State's products are exported. The awareness of the strategic importance of information and telecommunicationsfor continued economic growth throughout the State is very high. As an example, Telephone Utilities of Washington, which operates 43 exchanges in the State, has joined a consortium of independent telephone companies that will offer the advanced switching technology of common channel Signaling System 7. Several people noted that the use and demand for cellular telephony would be large in rural areas, especially among farmers. Gonzaga University in Spokane recently received a $10 million grant from the United States Department of Agriculture (USDA) to build a high-technology library to provide information as a tool for agriculture. Finally, the Palouse Economic Development, with a $100,000 grant from the Department of Community Development, has launched a project to help local businesses market goods abroad, a project for which telecommunications is indispensable.

Maine

Maine aggressively embraces telecommunications as an important way to overcome its isolation, its size, and its low population density. Improving education statewide through the use of telecommunications is the centerpiece of the State's development approach.

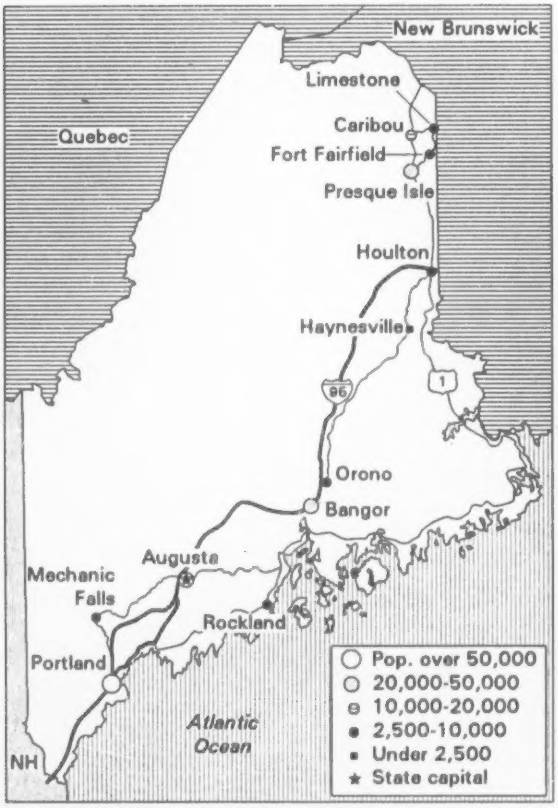
The largest of the New England States, Maine is the most sparsely populated State east of the Mississippi, with density ratios that match some large Midwestern States. In addition, nearly two-thirds of the State's 1.2 million citizens live in nonmetropolitan areas, typically in one of its nearly 500 small towns and villages. Despite recent growth, the State's economy is sluggish, with an average per-capita income at $13,954 in 1987, compared to the national average of $15,481.

Starting in the north, we visited Presque Isle and several of the surrounding towns before traveling south through Houlton and the small lumber town of Haynesville on the way to Orono and Bangor. The Telephone Association of Maine's annual meeting in Rockport provided a unique opportunity to speak with many players in telecommunications, with an emphasis on the perspectives of the local independent telephone companies. Finally, the staff went to Augusta to speak with the State officials and see the University of Maine's Interactive Television network in operation, then on to Portland to meet with New England Telephone and the governor's advisor on communication and economic development (see figure 5).

Economically Remote—Although geographically, culturally, and topographically opposites, Maine and New Mexico share several important characteristics with regard to economic development. Both are sparsely populated and relatively large. Maine's geographic isolation parallels New Mexico's cultural isolation. Sharing most of its border with Canada and the Atlantic Ocean, it is the single State to border on only one other State (New Hampshire). Just as New Mexico is divided into pueblos and remote enclaves, Maine is organized into small towns and villages. Both States have been relatively unaffected by larger, national economic trends and events.

But while many New Mexicans believe that the State is not yet ready to make full use of its resources, "Downeasters" welcome the change to participate on a national or global level. They are increasingly less content to remain economically isolated, particularly as the free trade agreement with Canada puts Maine at the crossroads of an important connection between Quebec, the Maritimes, and the United States' Northeastern cities.

Figure 5—Map of OTA's Field Study in Maine



SOURCE: Office of Technology Assessment, 1991.

Photo credit: Mark G. Young

A church spire, Presque Isle, ME

Rural Poverty—As in Washington, the economic growth that Maine has had in recent years is not distributed evenly throughout the State. According to the Deputy Commissioner of the Department of Community Development, the rich areas become richer, but the rural areas remain poor. While Portland and southern Maine have recently been successful in attracting service industries such as advertising agencies and insurance companies from around southern New England, northern Maine's economy, dependent largely on timber and potato farming, remains stagnant. Aroostook County, at Maine's northern "crown," faces a health care crisis as its population, many of whom are uninsured, can no longer support the four regional hospitals serving a county the size of the State of Connecticut.

Cooperative Development—The presence of Loring Air Force Base in Limestone, several miles north of Presque Isle, greatly benefits Aroostook County's economy. The base, like others around the country, stabilizes the regional economy and enables the community to afford educational facilities that would otherwise be beyond its reach. However, as residents realize that closing or descaling the base is a "when" not an "if" proposition, communities and business leaders are trying to find and create their own opportunities for development. Eight communities around and including Presque Isle qualified as one of the State's four Job Opportunity Zones. Although the Job Opportunity Zones are intended to provide opportunities and incentives for growth, the incentive of State support led communities to evaluate their resources and potential for development and to cooperate where they might ordinarily have not.

Local business and community leaders in Aroostook County have formed an ad hoc committee—Leaders Encouraging Aroostook Development (LEAD)—to tackle development issues that they believe are not properly treated by the Regional Planning Commission. Because transportation—including roads and highways, air access, and railroads—is such a vital element to development in remote rural areas like northern Maine, LEAD is working to reauthorize and release State funds to extend Interstate Route 95 to Presque Isle. LEAD, along with the University of Maine at Presque Isle, was instrumental in securing a grant from the Maine Science and Technology Center for a CAD/CAM system to be installed in one of Maine's four Research and Productivity Centers on the campus of the University of Maine at Presque Isle.

Telecommunications and Development Sanctioned From the Top—The former chairman of the National Governors Association's Subcommittee on Telecommunications, Governor John McKernan has championed the importance of telecommunications for the State's future welfare, and his fervor paces the State's economic development philosophy. In particular, his and others' commitment to telecommunications-assisted education is becoming a reality, as Maine is in the process of building a community college system based on interactive television. In addition, Rich Silkman, the Governor's advisor for State Planning, similarly supports telecommunications as a means of overcoming Maine's isolation and sparse population. Communications provides a way to recapture "space-specific rents" in rural areas, which have been declining as natural resources such as metal or wood are devalued.

Ken Gordon, the Chairman of the Public Utilities Commission, explicitly stated his view of the fundamental connection between communications regulation and economic development in an address before the Telephone Association of Maine. While pointing out that the State has a reasonably modern communications network with a high degree of digitization and fiber deployment, he noted that the State is hampered by high intrastate toll rates and by "rather modest marketing efforts" on the part of the telephone companies. In an effort to align communications and economic development goals, Chairman Gordon hopes to frame regulation to protect all parties—customers and small telephone companies included—without intrusive, detailed involvement by the PUC into the forces of the market.

On the other hand, the legislature, with the recent labor strife in the paper companies and the telephone company, is more cautious about development and technology and prefers keeping regulation in place. Representative Herb Adams warned in a speech before the Telephone Association of Maine that "technology is not an endless friend," citing the increasing incidence of junk fax and computerized telephone solicitations, and that often technology takes on a life of its own and becomes unresponsive to the consumer.

Overall, the support for the role of telecommunications in economic development among the State's leaders and the cooperation among these key policymakers seems greater in Maine than in any other State we visited. One resident explained this in terms of the State's small population. The State's leadership is comprised of only 200 people. They often socialize together and work out issues on an informal basis.

Photo credit: Mark G. Young

Mattawamkeag, ME

The Environment and the Role of the DEP—Aware that the State can ill-afford the status quo, most of Maine's residents support economic development. However, there is significant tension over the extent and nature of development, which appears largely over environmental issues. As in Washington State, timber is perhaps the most important resource for Maine's northern communities (much of the land in the north is owned by paper companies) and so pressure on logging industries tends to ruffle the feathers of citizens whose livelihoods are at risk.

The villain, from this perspective, is the Department of Environmental Protection (DEP)—dubbed by one resident "nature Nazis"—who have assumed the role of surrogate zoning board to monitor the sale and use of property in the absence of strong local governments. DEP has become influential in economic development. Viewed by some as bureaucratically sleepy, the DEP is resented by many in rural northern Maine, who feel squeezed by rules and regulations mandated from policymakers in Augusta.

However, the DEP's efforts to preserve the State's environment spring largely because much of the needed infrastructure—e.g., roads, bridges, and sewage treatment—is in disrepair and cannot support further development. In some cases, in order for a business to move, another one has to move out lest it exceed the capacity of the sewage plant. According to Jack Dexter, the President of the Maine Chamber of Commerce and Industry, regulation and the exhaustive regulatory process make it expensive to do business in Maine, especially for small businesses.

Concerns for the State's environment are likely to provide strong incentives in the future for the deployment of modern communications, according to Curt Sweet of the University of Southern Maine. As the condition of rivers and lakes in the State deteriorates and as logging companies are slow to replace harvested forests, the importance of an economy founded on nonpolluting, information-intensive industries is expected to become an important priority. Furthermore, Maine, along with the rest of the Northeast, is slowly losing industry to the west, where as we were told, public policy for the past decades has focused on developing inexpensive power sources.

Education, Telecommunications, and Economic Development—As in Kentucky, the low level of skills among Maine's residents was cited as a significant barrier to development. However, the State has, until recently, been hamstrung in its ability to adequately educate and train its workforce because the community college system has only been operating 1 year. When the commitment was made to create the community college system 10 years ago, an ambitious telecommunications-based system was seen as the most efficient and effective way to improve education in the State. The Education Reform Act of 1984, recognizing the relationship of education and development, provided additional impetus for a telecommunications-based network.

From the seven branch campuses of the University of Maine System which are connected by two-way, fully interactive video and audio, courses will eventually be broadcast to more than 200 high schools, university centers, and technical schools throughout the State—one within 12 miles of every resident. The system is intended to be used for college, secondary, and elementary level coursework as well as for adult continuing education.

Though still in its infancy, the success of the Community College of Maine's ITV network will in large part depend on the efforts of local educators to help their communities realize its potential. For very distant or isolated communities, ITV opens up new avenues for delivering education and other invaluable social services. There is some reluctance, though, among superintendents and teachers who fear that the success of such a system could imperil their jobs.

Independent Telcos and Rural Development—In Maine, just as in Kentucky, New Mexico, and Washington, the small independent telephone companies in general have more advanced switching and transmission equipment than the regional Bell affiliate, New England Telephone. However, this potential advantage can rarely be exploited because the small local telephone companies, for lack of the personnel and expertise, must rely on their Bell counterpart to set protocols and to popularize services. They are also limited in offerings because many of them are unable to afford the expense of filing service applications before the State Public Utility Commission. With regard to involvement in local development, the simple answer is that they lack the resources to market their communications wares and to help their customers take advantage of the network. There is also a built-in incentive for local telephone companies to limit growth, because as their business customers expand, they become targets for the larger phone companies to pick off.

The prominent issue for rural telephone companies in Maine involved the treatment of long-distance pricing and in particular the policy of extended area service. Because the independents rely heavily on the settlements from the pool of long-distance in order deflect the usually high cost of providing local service, efforts to reduce toll rates threaten to cut into this important subsidy.

Glossary

Analog Communications: A communication format in which information is transmitted by modulating a continuous signal, such as a radio wave. Voice and video messages originate in analog form since sound and light are wave-like functions; thus, they must be converted into digital messages in order to communicate along digital communications formats or media.

Bandwidth: The range of frequencies that can be transmitted along a communications channel. Also, the range of frequencies required to transmit a communications signal without undue distortion. The more information a signal contains, the more bandwidth it requires for transmission. For example, television signals require a bandwidth of 3 million hertz (cycles per second), whereas telephone conversations require only about 3,000 hertz. The higher the bandwidth the greater the amount of information that can be transmitted in a given timeframe.

Basic Exchange Telecommunications Radio System (BETRS): An FCC classification for digital microwave radio systems. *See* Digital Radio.

Bell Operating Companies (BOCs): As a result of AT&T's divestiture in 1984, the original Bell telephone system was divided into 22 local Bell operating companies. These now provide local telephone service across most of the country. These companies are managed by the seven "Baby Bells," the RBOCs or regional holding companies for the BOCs.

Bit (BInary digiT): The smallest unit of information a computer can use. A bit is represented as a "0" or a "1" (also "on" or "off"). A group of 8 bits is called a byte. Bits are often used to measure the speed of digital transmission systems.

Kilobit: 1,000 bits
Megabit: 1 million bits
Gigabit: 1 billion bits

Central Office: The telephone company facilities that house switching and related equipment, which serves the immediate geographical area. The central office is the most immediate point of interface between the telephone company and customers.

Centrex: A service offered by telephone companies that provides business customers direct inward dialing to their own lines allowing them to circumvent the public portion of the switching facilities. Centrex allows companies to more directly manage their telecommunications

Compact Disc Read-Only Memory (CD/ROM): An optical storage system for computers that permits data to be randomly accessed from a disc. With read only discs, new data cannot be stored nor can the disc be erased for reuse.

Digital Communications: A communications format used with both electronic and light-based systems that transmits audio, video, and data as bits of information (*see* Bit). Digital communications is particularly suited to data communications, since computers communicate and function digitally. Digital technology also allows communications signals to be compressed for more efficient transmission. Codecs (abbreviation for "coder-decoder") are required for video and voice signals to be transmitted in digital form, since video and voice are analog messages.

Digital Radio (BETRS): Radio signals that transmit digital signals. It has greater capacity and is more secure than analog radio since messages must be encoded digitally for transmission. *See* Basic Exchange Telecommunications Radio System.

Digitalization: The process of converting analog information, such as voice and video messages, into digital signals.

Divestiture: The break-up of the AT&T monopoly into the 7 regional Bell operating companies, Bellcore, and the 22 Bell operating companies. Divestiture resulted from the 1984 Modified Final Judgment, which settled the government's long-standing antitrust suit against AT&T. *See* Modified Final Judgment.

DS3 Circuits: DS3 circuits—also called T3 circuits—operate at a capacity of 45 megabits per second (Mbps). *See* T1 Circuits, Kilobits Per Second.

Electronic Data Interexchange (EDI): The use of computers and telecommunications technologies to process common transaction functions, such as invoices, shipping notices, and bills, that traditionally have entailed the transfer and processing of paper documents. With EDI, computers exchange information via telecommunications and process the information without the delay typically entailed with paper transactions. EDI improves the efficiency and effectiveness of operations by empowering businesses to purchase supplies and to produce and distribute products precisely when and where they are needed.

Fiber Optics: Hair thin, flexible glass rods that use light to transmit audio, video, and data signals. Fiber optics are particularly suitable for digital communications since light impulses go "on" and "off" to transmit messages (*see* Digital Communications). Fiber optic cable has much higher capacity than copper wire or coaxial cable and is not as subject to interference or noise.

Holistic: Related to or concerned with whole systems, as opposed to examining the constituent parts of a system. A holistic approach to development treats the economy, its politics, and its human interactions as interdependent.

Host-remote Switch: A device that can provide local switching capabilities for communities located far from a telephone company central office (*see* Central

Office). Host-remote switching can improve the quality of service for remote communities since their local calls do not have to travel the long distances, along which signals can be attenuated, to the central office to be switched. While the remote switch can perform most of the functions of a regular switch, it is dependent on a host switch typically found in a larger community.

Independent Telephone Company: A local exchange carrier that is not part of the Bell System of Bell operating companies (BOCs) and regional Bell operating companies (RBOCs). *See* Bell Operating Companies.

Integrated Services Digital Networks (ISDN): A protocol for high-speed digital transmission. ISDN provides simultaneous voice and high-speed data transmission along a single conduit to the users' premises. Two ISDN protocols have been standardized: with Narrowband ISDN, or 2B+D, two 64 kilobits per second (kbps) channels carry voice or data messages and one 16 kbps channel is used for signaling—carrying addressing and other call-related information; with Broadband ISDN, or 23B+D, 23 64 kbps channels carry voice or data messages and one 64 kbps channel is used for signaling. *See* Kilobits Per Second.

Interexchange Carrier (IXC): A telephone company—such as AT&T, MCI, or Sprint—that carriers long-distance calls. The IXCs are authorized by the Federal Communications Commission (FCC) to carry interLATA interstate traffic, and can be authorized by the State public service commissions to carry interLATA intrastate traffic (*see* Local Access and Transport Area).

Kilobits Per Second (kbps): A unit of measurement for the speed at which information travels. Also Mbps—Megabits per second, and Gbps—Gigabits per second. *See* Bit.

Local Access and Transport Area (LATA): LATAs were developed as a result of the divestiture settlement to define geographic areas within which the Bell operating companies (BOCs) can provide telephone service. (*See* Bell Operating Companies.) The settlement allows the BOCs to provide intraLATA service, but it forbids them from providing interLATA telecommunications.

Local Area Networks (LANs): Data communication networks that are relatively limited in their reach. They generally cover the premises of a building or a campus and are private networks—thus the equipment is not owned by a telephone company. Like all networking technologies, LANs facilitate communication and sharing of information and computer resources by the members of a group.

Local Calling Area: The area within which a customer may make a call without incurring long-distance charges.

Local Exchange: The geographic area in which there is a uniform price for telephone service. More than one central office may serve a local exchange. *See* Central Office.

Local Exchange Carrier (LEC): A telephone company that carries local calls. In most exchanges the LEC is a Bell operating company, but hundreds of independent telephone companies are LECs. State public service commissions regulate the monopoly services of LECs. *See* Bell Operating Companies.

Local Loop: The portion of the telecommunications network between the customers' premises and the telephone company's central office. *See* Central Office.

Metropolitan Area Networks (MANs): Still in the field-testing stage, metropolitan area networks provide switched data networking services at very high speeds (45 to 50 megabits per second) within a geographic area of at least 50 miles. MANs connect LANs to LANs, as well as LANs to WANs. These networks are optimally designed for shared usage. *See* Local Area Networks, Wide Area Networks.

Microwave: High-frequency radio waves used for point-to-point and omni-directional communication of audio, data, and video signals. Microwave frequencies require direct line of sight between the sending station and the receiving station to operate. Obstruction such as trees or buildings distort the signal.

Modified Final Judgment (MFJ) : The 1984 agreement between AT&T and the U.S. Justice Department, which settled the government's long-standing antitrust suit against AT&T and resulted in AT&T's divestiture (*see* Divestiture). As a result of the MFJ, the Bell operating companies (BOCs) and regional Bell operating companies (RBOCs) are prohibited from offering information services and limited in the extent to which they can engage in manufacturing and designing equipment; BOCs cannot offer long-distance service; and RBOCs cannot offer local telephone service. In 1989, the court decided to let RBOCs provide gateway services in order to encourage the development of an information service industry.

Nontraffic Sensitive (NTS) Costs: The costs that a local telephone company incurs in providing its subscribers with a connection to the company's central offices. The NTS portion of the company's plant is largely comprised of the telephone lines—local loops—running from the subscribers' premises to these central offices, and the switches located at the central offices. NTS costs depend primarily on the number of subscribers and the average length of the local loops. NTS costs do not vary with the amount of telephone traffic carried over the loops. Thus, NTS costs are often referred to as "fixed costs."

Open Network Architecture (ONA): A regulatory construct which was a product of the Federal Communications Commission's Computer Inquiries. ONA is a system in which the telephone companies allow enhanced service providers equal access to their network facilities. This equal access is referred to as *comparably efficient interconnection (CEI)*. Enhanced services include such routine functions as call forwarding and voice mail, but also include more sophisticated database manipulations and other services not yet imagined. With CEI, enhanced service providers (ESPs) can purchase the unbundled components—or *basic service elements (BSEs)*—such as switching capabilities or information processing capabilities, of the formerly unified public switched network to bring their services to customers. ONA is the FCC's attempt to eliminate the structural separation requirements that required the telephone companies to maintain separate subsidiaries for competitively offered services. Without such separations, competition would be fostered and more products would become available to consumers.

Packet Switching: The process of transmitting digital information by means of addressed packets—which include data, call control signals, and error control information—so that a channel is occupied only during the transmission of the packet. In contrast, data sent using modems occupies a circuit for the entire duration of the transmission, even when no data is actually traveling over the lines. Using packet switching, the various packets of information can travel along different routes on the network, allowing the carrier to optimize its network capacity.

Private Branch Exchange (PBX): A small telephone switch that typically serves extensions in a business or campus arrangement and also provides interconnectivity with the public network. A PBX offers similar capabilities as Centrex, except the equipment is owned by the customer rather than leased from the telephone company. *See* Centrex.

Rural Area Networks (RANs): As conceptualized by OTA, RANs would be shared-usage networks, configured to include a wide range of users in rural communities. RANs would allow rural communities to pool their demand for advanced telecommunications services in order to justify and share the cost of sophisticated equipment that individual users could not otherwise afford or fully utilize. RANs would not be isolated "technology islands," but would connect rural areas with the rest of the world.

Signaling System Seven (SS7): A control system for the public telephone network, SS7 allows telephone company computers to communicate directly with each other using specialized signaling circuits. The information traveling along these circuits is related to the routing of telephone calls. By using separate circuits for these purposes, the carriers do not have to use bandwidth on the voice circuits, and telephone call processing becomes more efficient and faster, enabling more services to be made available to consumers.

Subscriber Line Charges (SLC): Subscriber line charges are a convention adopted after divestiture to defray the portion of the cost of long-distance calls that use the local access plant. Prior to the divestiture of the Bell System, prices for long-distance service were set artificially high and the extra revenues were used to defray some of the costs of local service and keep local rates low. The Federal Communications Commission implemented SLCs after divestiture, when this cross-subsidization was no longer possible because long-distance service became competitive. SLCs range from about $2.50 to $6.00 per month.

Switch: A mechanical or solid-state device that opens or closes circuits, changes operating parameters, or selects paths or circuits, either on a bandwidth or time division basis. Digital switches typically switch signals by time division.

Switched Multimegabit Data Service (SMDS): SMDS is a high-speed, fast packet-switched service provided in a campus, or ring, type arrangement situated within a 50-mile radius.

T1 Circuits: T1 circuits have 24 channels—each carrying 64 kilobits per second (kbps) of information and operate at a capacity of 1.544 megabits per second (Mbps). T1 is a standard for transmission that is accepted in North America. *See* Kilobits Per Second.

Universal Service: A policy associated with the Communications Act of 1934, which granted AT&T the monopoly for telephone service in the United States, to provide telephone service to all who want it at a reasonable price.

Virtual Networks: Virtual networks establish logical, temporary connections as opposed to dedicated ones. From the users perspective they are similar to private networks.

VSATs: Very small aperture terminals, satellite receive dishes, approximately 1.8 to 2.4 meters in diameter, that are capable of sending and receiving voice, data, and/or video signals. VSATs can transmit over wide areas by relaying to satellites in geosynchronous orbit.

Wide Area Networks (WANs): Data communication networks that provide long-haul connectivity among separate networks located in different geographic areas. WANs make use of a variety of transmission media, which can be provided on a leased or dial-up basis. WANs can also be privately owned.

SOURCES: Jack L. Dempsey, *Telecom Basics* (Chicago,IL: Telephony division, Intertec Publishing, 1988); Jack L. Dempsey, *Transmission Basics* (Chicago, IL: Telephony division, Intertec Publishing, 1989); Jack L. Dempsey, *Datacom Basics* (Chicago, IL: Telephony division, Intertec Publishing, 1990); Graham Langley, *Telephony's Dictionary: Second Edition* (Chicago, IL: Telephony Publishing Corp., 1986); Raymond Lawton, *Factors Affecting the Definition of the Local Calling Area: An Assessment of Trends* (Columbus, OH: National Regulatory Research Institute) February, 1990; Office of Technology Assessment, *Linking for Learning: A New Course for Education*, OTA-SET-430 (Washington, DC: U.S. Government Printing Office, November, 1989); and Office of Technology Assessment, 1991.

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